Report of the Fraser River Panel to the Pacific Salmon Commission on the 2003 Fraser River Sockeye and Pink Salmon Fishing Season

Prepared by the

Pacific Salmon Commission
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Pacific Salmon Commission
600-1155 Robson Street
Vancouver, B.C.
V6E 1B5
(604) 684-8081
www.psc.org

REPORT OF THE

FRASER RIVER PANEL

TO THE PACIFIC SALMON COMMISSION

ON THE 2003 FRASER RIVER SOCKEYE AND PINK

SALMON FISHING SEASON

2003 PANEL MEMBERS AND ALTERNATES

CANADA	UNITED STATES
W. Saito, Chair	L. Loomis, Vice-Chair
M. Chatwin	D. Cantillon
M. Griswold	B. Kehoe
T. Lubzinski	R. Lincoln
K. Malloway	R. Charles
L. Wick	J. Giard
B. Assu	P. Patillo
T. Bird	W. Robinson
L. Rombough	
P. Sakich	
M. Shepert	

Prepared by

FISHERIES MANAGEMENT DIVISION

of the

PACIFIC SALMON COMMISSION

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I. EXECUTIVE SUMMARY

1. In 2003, the Fraser River Panel managed fisheries in the Panel Area that targeted Fraser River sockeye and pink salmon, under the terms of Annex IV of the Pacific Salmon Treaty that was revised on June 30, 1999. Chapter 4 of the Agreement provides catch sharing arrangements for Fraser River sockeye and pink salmon for the period 1999-2010. Under the terms of the Agreement, the 2003 United States catch in Panel Areas (Washington) was not to exceed 16.5% of the Total Allowable Catch (TAC) of Fraser River sockeye salmon minus a payback of up to 9,000 fish due to a catch overage carried forward from 2002. For Fraser River pink salmon, the United States share of the TAC was 25.7% plus up to 21,000 fish due to a catch underage in 2001. The Fraser River Panel managed commercial net fisheries and the Canadian "inside" troll fishery in the Panel Area, while Canadian fisheries outside the Panel Area were to be managed by Canada in a manner that accounted for international allocations of Fraser River sockeye and pink salmon to Washington fishers.

2. Chapter 4, Annex IV, of the Pacific Salmon Treaty was revised on February 17, 2005. The revised Annex included a new method for calculating TAC that was based on final in-season estimates of run sizes, management adjustments, test fishing catches and Aboriginal Fishery Exemptions. The Panel subsequently agreed that the new calculation method would be applied in 2002, 2003 and 2004.

3. Prior to the fishing season, the Panel recommended a fishery regime and management plan for Panel Area fisheries to the Pacific Salmon Commission. The plan was based on abundance and timing forecasts, and escapement targets for Fraser River sockeye salmon provided by Fisheries and Oceans Canada. The plan was also based on international allocation goals set in the Agreement, domestic allocation goals set by each country, management concerns for other stocks and species identified by each country, historic migration patterns, and fisheries dynamics.

4. Canada provided the Panel with run-size forecasts for Fraser River sockeye and pink salmon and guidelines for calculating spawning escapement targets at a meeting held April 30-May 1, 2003. The forecasts were provided at five probability levels: 25%, 50%, 75%, 80% and 90% probabilities that the run size would be exceeded. Canada identified conservation concerns for Early Stuart, Early Summer and Late-run sockeye run-timing groups. Summer-run sockeye were expected to provide the largest share of the catch. True Late-run sockeye conservation concerns assumed that the early upstream migration and associated high mortality that has occurred every year since 1996 would continue to occur in 2003.

5. The Panel used the Fishery Simulation Model to examine potential management options for Fraser River sockeye salmon at the 50% (5,502,000 fish) and 75% (3,141,000 fish) probability level forecasts, and Fraser River pink salmon at the 50% probability level forecast (17,273,000 fish). The Panel focused final planning efforts on expectations of a smaller Early Stuart run (75% probability level forecast of 57,000 fish) and the other runs at 50% probability level forecasts (412,000 Early Summer, 3,360,000 Summer, 322,000 Birkenhead and 1,319,000 True Lates), for a total Fraser sockeye run of 5,470,000 fish. Corresponding spawning escapement targets at these run sizes were 56,000 Early Stuart, 144,000 Early Summer, 1,176,000 Summer, 113,000 Birkenhead and 525,000 True Late-run spawners for a total of 2,014,000 sockeye. The escapement target for Fraser River pink salmon was 6,000,000 fish. Based on these run sizes, spawning escapement targets and other deductions, projected Total Allowable Catches (TAC) for international sharing were 2,899,000 Fraser sockeye and 11,253,000 Fraser pink salmon.

6. Domestic allocation targets for Fraser sockeye in Washington were as follows: Treaty Indian fishers were allocated 67.7% of the United States share minus 3,700 fish of the 9,000 fish payback, while Non-Indian fishers were allocated the remaining United States share minus 5,300 of the 9,000 fish payback. The allocation among Non-Indian fishers was 54% for purse seines, 41% for gillnets, and 5% for reefnets. Domestic allocation targets for Fraser River pink salmon in Washington were as follows: Treaty Indian and Non-Indian fishers were each

allocated 50% of the United States share and of the payback of 21,000 pink salmon for catch shortfalls in 2001.

7. Domestic allocation targets for Fraser sockeye in Canadian commercial fisheries were as follows: 41% for Area B purse seines, 14.5% for Area D gillnets, 30% for Area E gillnets and 14.5% for Area H trollers. Domestic commercial allocation targets for Fraser River pink salmon were 60% for Area B purse seines, 4% for Area D gillnets, 1% for Area E gillnets, 22% for Area G trollers and 13% for Area H trollers.

8. During pre-season planning, a forecast of the diversion rate of Fraser sockeye through Johnstone Strait was not available, so a diversion rate of 50% was assumed (on July 9, DFO provided a diversion rate forecast of 64%). The forecasts of run timing (50% cumulative migration through Canadian Area 20 – Juan de Fuca Strait) were July 6 for Early Stuart sockeye, August 13 for Chilko sockeye and August 31 for Fraser River pink salmon.

9. Simulation modeling of harvest strategies suggested the majority of Summer-run TAC could be harvested if the run returned at the 50% probability level forecast.

10. On June 5, 2003, the Panel agreed on guidelines to address conservation concerns for "true" Late-run sockeye (Adams, Lower Shuswap, Portage, Weaver, Harrison, Cultus, but not Birkenhead sockeye): (1) if the in-river mortality rate on True Late-run sockeye was estimated to exceed 47% or if their run size was estimated to be lower than the 50% probability level forecast, the exploitation rate would be reduced from 25% down to a range between 15% and 25%, based on Canada's escapement target; and (2) if the in-river mortality rate on True Late-run sockeye was estimated to be lower than 47% or if their run size was estimated to be higher than the 50% probability level forecast, consideration would be given to increasing the exploitation rate to levels exceeding 25%, consistent with meeting Canada's True Late-run escapement target. Birkenhead sockeye were passively managed and limited by the Summer-run exploitation rate.

11. Research studies were conducted to help determine the cause(s) of early river-entry behaviour of Late-run sockeye. This research included tagging, physiology, parasitology, oceanography and other studies.

12. The Panel's management plan focused on the conservation of Early Stuart, Early Summer and Late-run sockeye stocks and on the harvest of Summer-run sockeye. Fishery restrictions were anticipated early in the season to protect Early Stuart and Early Summer-run sockeye and late in the season to protect True Late-run stocks.

13. Between July 8 and September 26, the Panel conferred 26 times by telephone conference to discuss run status and enact in-season orders to regulate fisheries. PSC staff provided periodic updates on catches, escapements and racial composition, and recommended adoption of in-season run-size estimates. The Panel adopted regulations for Panel Area fisheries consistent with the pre-season planning constraints.

14. Catches of Fraser River sockeye salmon in all fisheries totalled 2,347,000 fish. The Canadian catch was 1,928,000 sockeye, United States fishers harvested 311,000 fish, and test fishery catches totalled 107,000 sockeye. Canadian catches included 1,036,000 fish in commercial fisheries, 805,000 fish in First Nations fisheries, 77,000 fish in recreational fisheries, 600 fish in charter fisheries and 10,000 Weaver Creek sockeye in an ESSR (excess salmon to spawning requirements) fishery. Within the United States catch, 244,000 fish were harvested in Washington waters and 68,000 in Alaska. Commercial fishery catches in both countries summed to 1,347,000 fish.

15. Catches of Fraser River pink salmon totalled 2,069,000 fish: 1,216,000 fish in Canada, 811,000 fish in the United States and 42,000 fish in Panel-approved test fisheries. Included in the Canadian total were 833,000 fish in commercial, 296,000 fish in First Nations and 87,000 fish in recreational fisheries. In the United States, 772,000 pink salmon were harvested in commercial and 39,000 fish in recreational fisheries.

16. The Stock Monitoring program provided in-season estimates of abundance, migration timing, and diversion rate of Fraser River sockeye and pink salmon throughout the fishing season. The peak migration timing through Area 20 (Juan de Fuca Strait) was July 4 for Early Stuart sockeye (one day later than average), July 30 for Early Summer sockeye (five days later than average), August 7 for Summer-run sockeye (approximately average timing), August 15 for True Late-run sockeye (approximately average timing), and August 25 for Fraser River pink salmon (six days earlier than average). Estimates of overall diversion rates through Johnstone Strait were 74% for Fraser sockeye and 48% for Fraser pink salmon.

17. The Racial Identification program provided estimates of stock composition for sockeye catches in commercial, Aboriginal and test fisheries. Scale and DNA data were employed in this process. Stock composition data were used to estimate the run size and gross escapement of individual stock groups. DNA estimates of stock composition confirmed the presence of True Late-run sockeye at critical times during the season. Genetic stock identification (GSI) techniques were used to estimate the contribution of Fraser River pink salmon in commercial and test fisheries.

18. Compared to the 50% probability level forecasts, Early Stuart adult returns (30,000 fish) were 66% lower, Early Summer-run returns (549,000 fish) were 33% higher, Summer-run returns (2,820,000 fish) were 16% lower, and Late-run returns (1,489,000 fish) were 9% lower. Overall, the return (4,898,000 adults and 8,600 jacks) was 11% lower than the 50% probability level forecast for adult sockeye. Among Summer-run stocks, Chilko sockeye dominated the returns, followed by Quesnel and Late Stuart /Stellako sockeye. The largest Late-run return was from Late Shuswap/Portage stocks, followed by Birkenhead and Weaver/Harrison/Cultus sockeye. The run-size estimate for Fraser River pink salmon is highly uncertain, because DFO did not conduct an escapement enumeration program in 2003 and most of the run was comprised of escapement rather than catch (catch was enumerated). The final in-season run-size estimate of Fraser River pink salmon was 26,000,000 fish, which is considerably higher than the 50% probability level forecast and likely the largest run since at least 1959.

19. For True Late-run sockeye, an exploitation rate limit was employed in addition to the spawning escapement target discussed above. Management actions through most of the season were predicated on a 25% True Late-run exploitation rate objective. Late in the season, due to an earlier than expected upstream migration of True Late-run sockeye, this limit was reduced to 15%. Based on a catch of 378,000 True Late-run sockeye in all fisheries, the exploitation rate was 32% or about twice the limit.

20. Final estimates of spawning escapements to streams in the Fraser River watershed totalled 1,979,000 adult sockeye. This escapement was 8% larger than the brood year (1999) escapement of 1,831,000 adults. Spawning escapements for Early Stuart sockeye (13,000 fish) were approximately half of the brood year level; Early Summer-run escapements (194,000 fish) were 88% higher than in the brood year; Summer-run escapements (1,002,000 fish) were 22% lower than the brood year; and Late-run escapement (770,000 fish) was 83% higher than the brood year. As noted above, DFO did not conduct an escapement enumeration program on Fraser River pink salmon in 2003, however, with a run size of 26,000,000 fish and catch of 2,069,000 fish, the escapement (by subtraction of catch from total run) of almost 24,000,000 fish was the highest since at least 1959. The success of spawning by female sockeye in the entire watershed averaged 98%, which exceeded the brood year spawning success rate (90%).

21. Final in-season spawning escapement targets were 29,000 Early Stuart, 207,000 Early Summer, 1,130,000 Summer, 132,000 Birkenhead and 525,000 True Late-run sockeye, for a total of 2,023,000 Fraser sockeye. Actual spawning ground escapements of Early Stuart sockeye were about half the target, while escapements of Early Summer, Summer and True Late runs were slightly below the targets (within 15%), and Birkenhead escapement was more than double the target. Total spawning escapements of Fraser sockeye were only slightly below (2%) the overall target. The spawning escapement of 23,931,000 Fraser River pink salmon was more than three times the final in-season target of 7,800,000 fish.

22. Final in-season gross escapement targets plus management adjustments were 29,000 Early Stuart, 454,000 Early Summer, 1,645,000 Summer, 152,000 Birkenhead and 1,122,000 True Late-run sockeye, for a total of 3,402,000 Fraser sockeye. The Early Stuart target was achieved, with only minor fishery removals occurring in test fisheries. Final in-season estimates of gross escapement were under the targets for Early Summer (15% less) and True Late runs (19% less), considerably above the target for Summer-run stocks (35% more) and higher still for Birkenhead (71% more). The overall achievement of gross escapement targets for total Fraser sockeye was 406,000 fish (12%) over the target.

23. Based on the new method for calculating TACs and international shares (see Item 2), Washington fishers caught 118,000 fewer sockeye and 3,876,000 fewer pink salmon than their share, while Canadian fishers caught 369,000 fewer sockeye and 12,254,000 fewer pink salmon than their share. The catch underages in both countries resulted primarily from harvest constraints on True Late-run sockeye that limited access to surpluses of other sockeye stocks and pink salmon in mixed stock fisheries.

24. In relation to domestic allocations of Fraser sockeye in the United States, Treaty Indian fishers caught 7,700 fish less than their target and Non-Indian fishers harvested 7,700 fish more than their target. Among Non-Indian fishers, purse seines and reefnets exceeded their targets by 2,900 and 3,400 fish, respectively, while gillnets were 6,300 fish short. With regard to Fraser pink salmon, Treaty Indian fishers were 66,000 fish under and Non-Indian fishers were 66,000 fish over their catch targets.

25. With respect to Canadian domestic allocation goals, within the Canadian commercial catch of 1,036,000 Fraser sockeye, Area B purse seines were 62,000 fish over, Area D gillnets were 17,000 fish over, Area E gillnets were 52,000 fish under, and Area H trollers were 26,000 fish under their allocations. For Fraser River pink salmon, Area B purse seines were 222,000 fish over, Area D gillnets were 17,000 fish under, Area E gillnets were 10,000 fish over, Area G trollers were 184,000 fish under, and Area H trollers were 31,000 fish under their respective allocations.

26. The restrained fisheries in 2003 resulted in moderate by-catches of non-Fraser sockeye and pink salmon and of other salmon species in commercial net fisheries in the Panel Area. Catches of non-Fraser pink salmon totalled 86,000 fish (mostly in Washington waters), 11,400 chinook salmon (divided equally between Canadian and U.S. waters) and 3,600 coho salmon (in Washington waters). Catches of non-Fraser sockeye and of chum and steelhead were small.

27. By Panel agreement, any remaining paybacks after the 2003 season were deemed to have been cancelled. Consequently, there were no paybacks to carry forward to 2004 for either Fraser sockeye or pink salmon.

II. FRASER RIVER PANEL

Under the Pacific Salmon Treaty, the Fraser River Panel is responsible for in-season management of fisheries that target Fraser River sockeye and pink salmon within the Panel Area (Figure 1). Prior to the fishing season, the Panel recommends a fishery regime and a management plan for Panel Area fisheries to the Pacific Salmon Commission (PSC). The plan is based on: (1) abundance and timing forecasts and escapement targets for Fraser River sockeye and pink salmon stocks provided by Fisheries and Oceans Canada (DFO); (2) international catch allocation goals set by the agreements between the Parties; (3) domestic catch allocation goals of each country; (4) management concerns for other stocks and species also identified by each country; and (5) historic patterns in migration and fisheries dynamics. The objectives that guide the Panel's decision-making listed in descending priority are: to achieve the spawning escapement targets, meet international catch allocation goals, and meet domestic catch allocation objectives. Conservation concerns of the Parties for other species and stocks are addressed throughout the process.

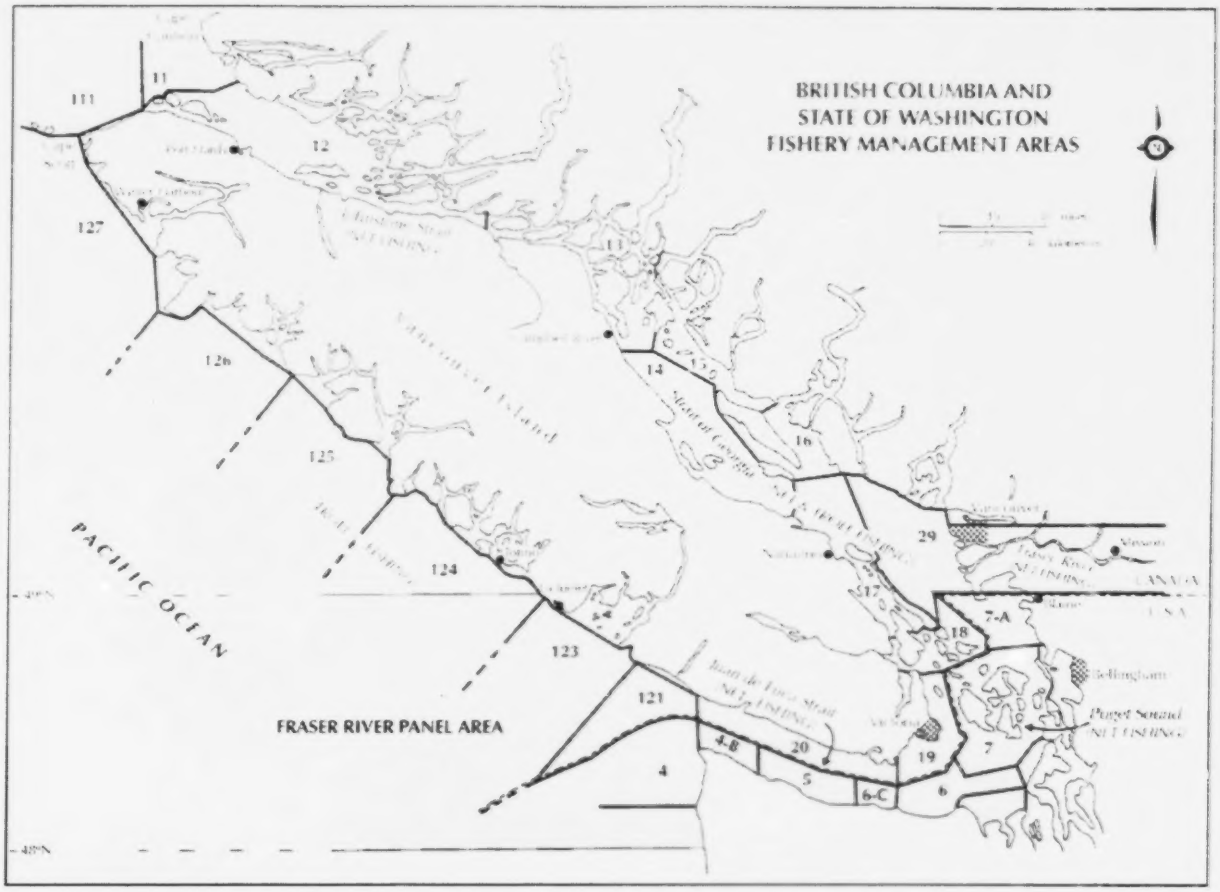

Figure 1. Fishery management areas and commercial gear used in the Fraser River Panel Area and Canadian south coast waters.

In 2003, the pre-season management plan adopted by the Panel was based on fishery scenarios that were designed to achieve the escapement targets and catch goals, given two levels of pre-season expectations. These were the 50% and 75% probability level forecasts of abundance. The two scenarios provided the Panel with approximate dates of first openings in each Panel Area fishery. Using in-season commercial and test fishing data and analyses from PSC staff, the Panel developed a weekly fishing pattern in response to in-season deviations from expectations. The activities of the Panel were facilitated by the Fraser River Panel Technical Committee. They worked in conjunction with PSC staff and provided their respective National sections of the Panel with technical advice.

Under the terms of the revised Chapter 4 of Annex IV of the Pacific Salmon Treaty (1999) between Canada and the United States, the Panel exercised its regulatory mandate in Panel Areas only for commercial net fisheries and the Canadian inside (Strait of Georgia) troll fishery directed at Fraser River sockeye and pink salmon. The development of management approaches for other species and stocks intercepted in south coast areas are the responsibility of the Southern Panel and the Commission. The implementation of management plans in specific areas is the responsibility of the appropriate country.

The Panel membership and their affiliations during the 2003 season were:

CANADA	UNITED STATES
Members	
Mr. W. Saito, Chair Fisheries and Oceans Canada	Ms. L. Loomis, Vice-Chair Treaty Indian tribes
Mr. M. Chatwin Salmon processing industry	Mr. D. Cantillon, Vice-Chair National Marine Fisheries Service
Mr. M. Griswold Troll fisher	Mr. B. Kehoe Commercial salmon fishing industry
Mr. T. Lubzinski Gillnet fisher	Mr. R. Lincoln Washington Department of Fish and Wildlife
Chief K. Malloway Canadian First Nations	
Mr. L. Wick Purse seine fisher	
Alternates	
Mr. B. Assu Purse seine fisher	Mr. R. Charles Treaty Indian tribes
Mr. T. Bird Sport fisher	Mr. J. Giard Commercial salmon fishing industry
Mr. R. Brahniuk Fisheries and Oceans Canada	Mr. P. Patillo Washington Department of Fish and Wildlife
Mr. L. Rombough Gillnet fisher	Mr. W. Robinson National Marine Fisheries Service
Mr. P. Sakich Troll fisher	
Mr. M. Shepert Canadian First Nations	

III. INTRODUCTION

Management issues pertaining to Late-run sockeye continued to be a primary focus of the Fraser River Panel in 2003. After the large surplus of Late-run sockeye spawners in 2002, there was a desire for increased management flexibility to balance the primary objective of True Late-run sockeye conservation with opportunities to harvest fish that were surplus to spawning requirements. In pre-season deliberations, the Panel recognized the likelihood of the early upstream migration behaviour of Late-run sockeye continuing, and the probability that subsequent en route and pre-spawning losses would occur. A brief summary of management issues pertaining to the 2003 season is presented below.

Pre-season Planning

During pre-season planning for Fraser River sockeye and pink salmon fisheries in spring 2003, DFO identified conservation concerns for Early Stuart and True Late-run sockeye. Due in part to freshwater survival concerns in the brood year (1999), the Panel adopted the 75% probability level forecast for Early Stuart sockeye (57,000 fish), which precluded all directed harvest opportunity. For other timing groups the 50% probability level forecast was adopted. This included forecast returns of 412,000 Early Summer, 3,360,000 Summer and 1,641,000 Late-run (including Birkenhead) sockeye.

Taking conservation concerns for True Late-run sockeye into account, plans were developed that called for harvest restrictions, with the severity of the restrictions linked to in-season assessments of the True Late-run 50% migration date at Mission. Priority was also given to protecting Early Summer stocks. Conversely, Summer-run stocks were forecast to be relatively abundant, with DFO escapement requirements achievable at exploitation rates of approximately 65%. During the pre-season planning process, the Panel directed the FRPTC and PSC staff to examine options for harvesting Summer-run stocks without adversely impacting the co-migrating sockeye from Early Summer and Late-run timing groups. Thus, while it was expected that Summer-run sockeye would provide the majority of catch in 2003, the harvest of this run would likely be constrained by conservation concerns for these other stocks, resulting in Summer-run escapements that would exceed DFO's spawning escapement targets. The degree to which harvest of Summer-run fish would be constrained was related primarily to the allowable harvest of True Late-run fish, with True Late-run exploitation rates expected to range from 15% to 25%, depending on in-season estimates of run size, in-river migration timing and en route mortality.

A large return of Fraser River pink salmon was forecast in 2003 (17,273,000 fish at the 50% probability level). The large return was expected to generate large numbers of fish surplus to spawning escapement requirements. However, management constraints on Late-run sockeye (the latter part of which co-migrate with Fraser River pink stocks) were expected to limit harvest opportunities on pink salmon stocks, resulting in large potential spawning surpluses.

Run Size and Escapement

In-season estimates of most sockeye returns were generally close to the pre-season 50% probability level forecasts. The main exception was Early Stuart sockeye with a total return of 30,000 fish, substantially below the 75% probability level forecast of 57,000 fish. Returns of Early Summer and Birkenhead sockeye were slightly higher than the forecasts, while returns of Summer and True Late-run stocks were slightly below. Overall, the final in-season estimate of about 5,400,000 sockeye was very close to the forecast of 5,467,000 Fraser sockeye. Post-season estimates of sockeye production (4,898,000 fish) were lower than the in-season estimates, due to spawning ground enumeration estimates received from DFO and to post-season revisions to hydroacoustic estimates of Mission passage.

The Fraser River pink salmon run of about 26,000,000 fish in 2003 was 51% above the 50% probability level forecast of 17,273,000 fish. During the period f om 1991 to 1999, the estimated total run of Fraser River pink salmon declined steadily by about 4,000,000 fish every odd-year from 22,180,000 fish in 1991 to 3,592,000 fish in 1999. This trend was reversed in 2001 with an unexpectedly large return of approximately 21,000,000 pink salmon resulting from a fry-to-adult survival rate of 9.5%, which was approximately three times higher than the long-term average survival of 3.5%. The 2003 return extends the recent increasing population trend, but resulted from an average fry-to-adult survival rate of 3.8%.

Due to the low forecast, Early Stuart sockeye were protected from harvest in both marine and in-river fisheries. Harvests of the other Fraser River sockeye runs were constrained due to conservation concerns for Early Summer and True Late-run stocks. Total harvests in all fisheries included 1,200 Early Stuart (4% of run), 278,000 Early Summer (51% of run), 1,544,000 Summer (55% of run), 147,000 Birkenhead (31% of run) and 378,000 True Late-run sockeye (37% of run, includes 10,000 ESSR catch of weaver sockeye), for a total Fraser sockeye catch of 2,347,000 adult sockeye (48% of run). Canadian sockeye harvests in all fisheries summed to 1,928,000 fish (39% of run), while U.S. harvests totalled 311,000 fish (6% of run). Due to the harvest constraints for Late-run sockeye, the total harvest of Fraser River pink salmon was 2,069,000 fish (8% of run), including 1,216,000 fish in Canadian fisheries (5% of run) and 811,000 fish in United States fisheries (3% of run).

The Panel was relatively successful in fulfilling escapement objectives in 2003. The final spawning escapement estimate for adult sockeye was 1,979,000 fish, which was only 2% below the overall target for Fraser sockeye and 8% larger than the brood year. Escapement estimates for Early Stuart, Early Summer and Summer-run sockeye were 13,000 fish, 194,000 fish and 1,002,000 fish, which correspond to escapement shortfalls of 55%, 6% and 11% below their respective spawning escapement targets. Escapements to the Early Stuart system were particularly distressing, being about half the brood year level and only 12% as large as the average escapement on the last four cycle years (109,000). Although Early Summer escapements were larger than in the brood year and Summer-run escapements were smaller, both were similar to the average for the last four cycle years. Upstream migration conditions for these early to mid-summer groups were unfavourable, due to warm water temperatures that likely caused some en route mortality.

In contrast, the Birkenhead spawning escapement of 324,000 spawners was more than double the target, more than six times larger than brood year spawners and more than twice the average spawners for the last four cycle years. Although considered a component of the Late-run complex, the Birkenhead group includes Big Silver and other Harrison Lake stocks that differ from True Late-run sockeye in their migration behaviour (less migration delay).

The escapement of True Late-run sockeye was 446,000 fish, which was 15% less than the target. Although the 15% exploitation rate target for True Late-run sockeye was exceeded, spawning escapements in 2003 exceeded those in 1999. In contrast to the relatively small en route losses observed for Late Shuswap stocks, high en route losses were recorded for Weaver and Harrison stock groups. The pattern of lower proportional loss estimates for upper versus lower river Late-run stocks has been fairly consistent since 1995, but the cause is unknown.

Early Migration of True Late-run Sockeye

True Late-run sockeye have migrated into the Fraser River with a much reduced residency in the Strait of Georgia in recent years. In 2003, the peak of the True Late-run sockeye migration was August 15 in Area 20, and September 1 in the Fraser River at Mission. The average migration time for transit between these two locations is approximately eight to nine days, which indicates the average Late-run sockeye delay in 2003 was approximately one week, significantly shorter than the historical delay of three to six weeks. It is not known whether the improved True Late-run sockeye survival in 2002 and 2003 (relative to the much higher loss rates observed in prior years since this behaviour became pronounced) will persist in 2004 and beyond. A greater understanding of the causal mechanisms of the migration behaviour, and the interaction of the

mortality agents acting on the fish during their upstream migration would be extremely useful in improving management of Late-run sockeye.

Prior research has shown that early upstream migration results in the increased susceptibility of Late-run fish to a myxosporian parasite, *Parvicapsula minibicornis*, the apparent cause of much of the en route and pre-spawning mortality of True Late-run sockeye in recent years. However, the parasite has been effectively eliminated as the causal agent with respect to the early migration behaviour. Research studies are being conducted to monitor the migratory behaviour of True Late-run sockeye and to determine the possible cause(s) of their early river entry behaviour. These studies include the following:

- A radio-tagging study to examine various aspects of Late-run sockeye migratory behaviour in the Strait of Georgia, the in-river mortality of the different marine and in-river timing components of the migration, and the subsequent spawning success of the migration components.
- Physiological studies are attempting to determine possible causes of the early migration behaviour. Components of the physiological research include: examining changes in the physiology of both delaying and non-delaying migration groups of sockeye (by examining blood and muscle tissue) during their marine and freshwater migration; assessing patterns of energy use and behaviour of the fish in physically challenging portions of their migration; and evaluating intra and inter-annual effects of the *Parvicapsula minibicornis* parasite on the physiology and mortality of Late-run sockeye.

Results of the 2003 studies are summarized in Appendix C.

IV. MANAGEMENT ACTIONS

A. Forecasts of Returns, Escapement Targets, and Potential TAC

Canada presented the Panel with Fraser River sockeye and pink salmon run-size forecasts at the Fraser Panel meeting held on February 12 and 13, 2003. The data used to develop the pre-season run-size forecasts produced highly uncertain estimates of the potential return strength of sockeye and pink salmon stocks, and this uncertainty was reflected in the range of run sizes corresponding to the various probability levels of the forecast. The Panel was provided with a range of probability levels of the forecast; specifically the 25%, 50%, 75%, 80% and 90% probabilities of the run size exceeding a specified projection (Appendix A, Table 1). For planning purposes, the Panel used the 50% and 75% probability level forecasts for both sockeye (5,502,000 fish and 3,141,000 fish respectively) and pink salmon (17,273,000 fish and 11,698,000 fish respectively). When sockeye stocks that were missing from the original forecast were included, the 50% probability level forecast increased to 5,467,000 fish and the 75% probability level forecast increased to 3,141,000 fish.

Canada presented the Panel with a spawning escapement plan for Fraser sockeye and pink salmon at Panel meetings held April 30-May 1, 2003. The escapement plan for 2003 was a continuation of the Fraser River sockeye rebuilding strategy that was developed in 1987. Key components of the plan included:

1. Early Stuart: maximizing the potential to achieve the minimum escapement target, given the expectation of a poor return;
2. Early Summer run: carefully plan targeted fisheries to maintain escapements at brood year levels;
3. Summer run: setting the escapement target close to the brood year level and establishing a maximum exploitation rate of 65% for Summer-run sockeye;
4. Late run: escapement targets for Birkenhead to follow the Summer-run plan, and escapement targets for True Late-run components that account for continued early upstream migration behaviour and mortality plus additional constraints in Canada to protect Cultus Lake sockeye.

Forecasts of peak arrival timing (50% run passage through Canadian Area 20) with associated prediction intervals for Early Stuart and Chilko sockeye were provided on July 3. Early Stuart sockeye were forecast to have a peak arrival timing in Area 20 of July 6, which was four days later than the long term average, while for Chilko sockeye the forecast was August 13, six days later than the long term mean. On July 9, DFO provided a forecast of sockeye salmon diversion rate through Johnstone Strait of 64%. An in-season forecast of August 31 as the peak timing in Area 20 for Fraser River pink salmon, was provided by DFO on August 21.

At a meeting on June 4 and 5, the Fraser River Panel approved the 2003 fishery management plans for Fraser River sockeye and pink salmon in Panel Area waters. Uncertainty about the forecast abundances for sockeye stocks led the Panel to develop fishery plans at return abundances corresponding with the 50% and 75% probability level forecasts. TACs for Fraser River sockeye salmon were calculated using the spawning escapement targets, projected test fishery catches, projected management adjustments, and an Aboriginal Fisheries Exemption of 400,000 fish as specified in Annex IV of the Pacific Salmon Treaty. Similarly, TACs for Fraser River pink salmon were established taking into account escapement and test fishing requirements.

As in 2002, the Fraser River Panel endorsed the use of a Management Adjustment model (MA) for the 2003 management season. At the June 4-5 Panel meeting, the Panel adopted a pre-season Early Summer-run MA estimate of 48,000 fish (this assumed benign migration conditions) for use until in-season data became available. No MA was recommended for the Early Stuart stock because the small run-size forecast did not allow for directed harvest of this stock.

PSC staff provided the Panel with daily abundance curves (Figure 2) that projected the arrival of Fraser River sockeye salmon in Area 20. This figure shows the expected timing and abundance of major stocks in 2003, at the 50% probability level forecasts (5,502,000 sockeye salmon and 17,273,000 pink salmon).

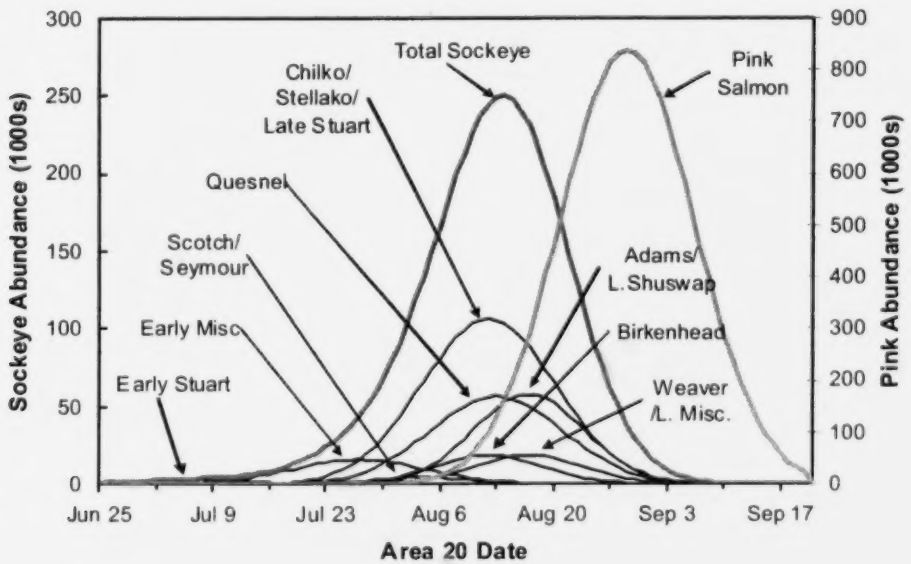

Figure 2. Expected daily abundance curves for migrating Fraser River sockeye and pink salmon in 2003 (Area 20 date), based on forecast abundances and timing patterns.

Prior to the commencement of active management, the Panel adopted the 75% probability level forecast of 57,000 fish for Early Stuart sockeye due to concerns about freshwater survival in the brood year, while leaving the forecasts for the other stock groups at the 50% probability level. In addition, Canada provided a revised spawning escapement plan (Appendix A, Table 2). Based on these forecasts, escapement targets, management adjustments, projected test fishing catches and Aboriginal Fishery Exemptions, the pre-season projections of TAC available for international

sharing were 2,899,000 sockeye and 11,253,000 pink salmon (Table 1). Corresponding pre-season catch goals for Washington State fishers were 469,000 Fraser sockeye (16.5% of the TAC minus a catch payback of up to 9,000 sockeye due to a catch overage in 2000) and 2,913,000 Fraser pinks (25.7% of the TAC plus a payback of up to 21,000 pink salmon due to a catch underage in past years). Projections of corresponding gross escapement targets are shown in Table 2.

Table 1. Pre-season projections of total runs, spawning escapement targets and other deductions, and total allowable catches for Fraser River sockeye and pink salmon fisheries in 2003.

		Deductions				
Run	Forecast Run	Spawning Escapement Target	Management Adjustment	Aboriginal Exemption	Test Fishing	Allowable Catch
Sockeye Salmon						
Early Stuart	57,000	56,000	0	0	1,000	0
Early Summer	412,000	144,000	48,000	59,500	8,500	152,000
Summer	3,360,000	1,176,000	0	278,200	70,000	1,835,800
Late	1,641,000	638,000	0	62,300	30,000	910,700
Birkenhead	322,000	113,000	0	5,900	5,900	197,200
True Lates	1,319,000	525,000	0	56,400	24,100	713,500
Total Sockeye	5,470,000	2,014,000	48,000	400,000	109,500	2,898,500
Pink Salmon						
Total Pinks	17,273,000	6,000,000	n/a	n/a	20,000	11,253,000

Table 2. Pre-season projections of gross escapement targets for Fraser River sockeye and pink salmon in 2003.

Run	Spawning Escapement Target	Management Adjustment	Fraser Aboriginal Catch Target	In-river Recreational Target	Gross Escapement Target
Sockeye Salmon					
Early Stuart	57,000	0	0	0	57,000
Early Summer	144,000	48,000	94,500	5,000	291,500
Summer	1,176,000	0	470,200	45,000	1,691,200
Late	638,000	0	135,300	1,000	774,300
Birkenhead	113,000	0	20,300	0	133,300
True Lates	525,000	0	115,000	1,000	641,000
Total Sockeye	2,015,000	48,000	700,000	51,000	2,814,000
Pink Salmon					
Total Pinks	6,000,000	0	0	10,000	6,010,000

Goals for the domestic allocation of Fraser sockeye among Washington fishers were provided as follows:

1. Treaty Indian fishers were to receive 68.7% of the United States TAC while Non-Indian fishers would receive 31.3%;
2. Among Non-Indian commercial gear types, allocation targets were 54% for purse seines, 41% for gillnets and 5% for reefnets.

The domestic allocation goal for Fraser River pink salmon among Washington State fishers was for an equal share to Treaty and Non-Indian fishers. No inter-gear or area allocations were identified.

Pre-season projections of the Canadian share of the TACs shown in Table 1 were 2,429,000 Fraser sockeye (2,829,000 fish with the Aboriginal Fishery Exemption included) and 8,340,000 Fraser pinks. With respect to sockeye, Canadian catch shares included 700,000 fish for in-river First Nations (includes 400,000 AFE), 250,000 fish for marine First Nations, 51,000 fish for in-river recreational fishers and 4,000 fish for marine recreational fishers. Proportional sharing arrangements for the balance of the Canadian sockeye share among the commercial sector were 41% for Area B purse seines, 14.5% for Area D gillnets, 30% for Area E gillnets, 0% for Area G trollers and 14.5% for Area H trollers. Expectations for non-commercial catches of Fraser pinks included 20,000 fish for marine First Nations, 10,000 fish for in-river recreational fishers and 65,000 fish for marine recreational fishers. The commercial allocations of the remaining Canadian balance were 60% for Area B purse seines, 4% for Area D gillnets, 1% for Area E gillnets, 22% for Area G trollers and 13% for Area H trollers.

B. Pre-season Regulations

Panel meetings from late-April to early June focused on development of an optimum management approach for harvest of Summer-run sockeye while recognizing the harvest protection required for Early Summer-run stocks, and conservation concerns for True Late-run stocks. In addition, harvest opportunities for Fraser River pink salmon were considered.

The Fishery Simulation Model was run with both the 50% and 75% probability level forecasts of abundance, and using the gross escapement targets and international and domestic allocation goals outlined above. During the simulation modelling, DFO's forecasts of the diversion rate via Johnstone Strait (Figure 3), and 50% arrival timing dates for Early Stuart (to the lower Fraser River) and Chilko runs (to Area 20) were not available. However, it was anticipated that the diversion rate would be approximately normal (50% diversion rate) in 2003. It was also assumed that Fraser sockeye stocks would have average marine timing. The recent Late Shuswap dominant and sub-dominant cycle-year average Mission timing, linked to expected en route losses estimated from the Late-run MA model, was used to project Late-run sockeye behaviour. These assumptions generated an upstream timing estimate of September 12 and an associated en route loss estimate of 47% for True Late-run stocks. More severe migration timing (September 5) and en route loss estimates (68%) were also considered. These modelling assumptions enabled the Fraser River Panel to consider the potential loss to spawning populations in the event that the magnitude of True Late-run mortality prior to spawning was similar to recent past years. The simulation modelling focused on harvesting Summer-run sockeye (mainly Chilko and Quesnel). Restrictions on fishing were modelled early in the season to protect Early Stuart and Early Summer-run sockeye stocks. A maximum exploitation rate on True Late-run stocks (excluding Birkenhead sockeye) of 25% was established at the 50% probability level forecast, given the pre-season timing and en route mortality assumptions. The maximum exploitation rate on True Late-run sockeye declined to 15% at the 75% probability level forecast with assumed September 5 in-river timing. This strategy was designed to balance harvest opportunities on Summer-run stocks with the need to conserve Late-run stocks.

Results of the simulation modelling of fisheries at the 50% probability level forecast showed that the majority of Summer-run TAC could be harvested, even with the constraints imposed by conservation requirements for Early Summer-run sockeye and the 25% exploitation rate limit for True Late-run stocks, assuming average historical average timing separation occurred between Summer-run and Late-run stocks. Modelling indicated that the unharvested Summer-run surplus increased if the timing separation decreased relative to the historical average separation. At the 75% probability level forecasts, the model indicated that the Summer-run TAC could be fully harvested, even with a 15% exploitation rate limit on True Late-run sockeye, because with lower abundance levels the optimal Summer-run exploitation rates would be lower. In contrast, the Late-run harvest constraints severely curtailed the ability of fishers to harvest the estimated TAC of Fraser River pink salmon, and large excess escapement surpluses (i.e., greater than the spawning escapement target) were projected at both the 50% and 75% probability level forecasts.

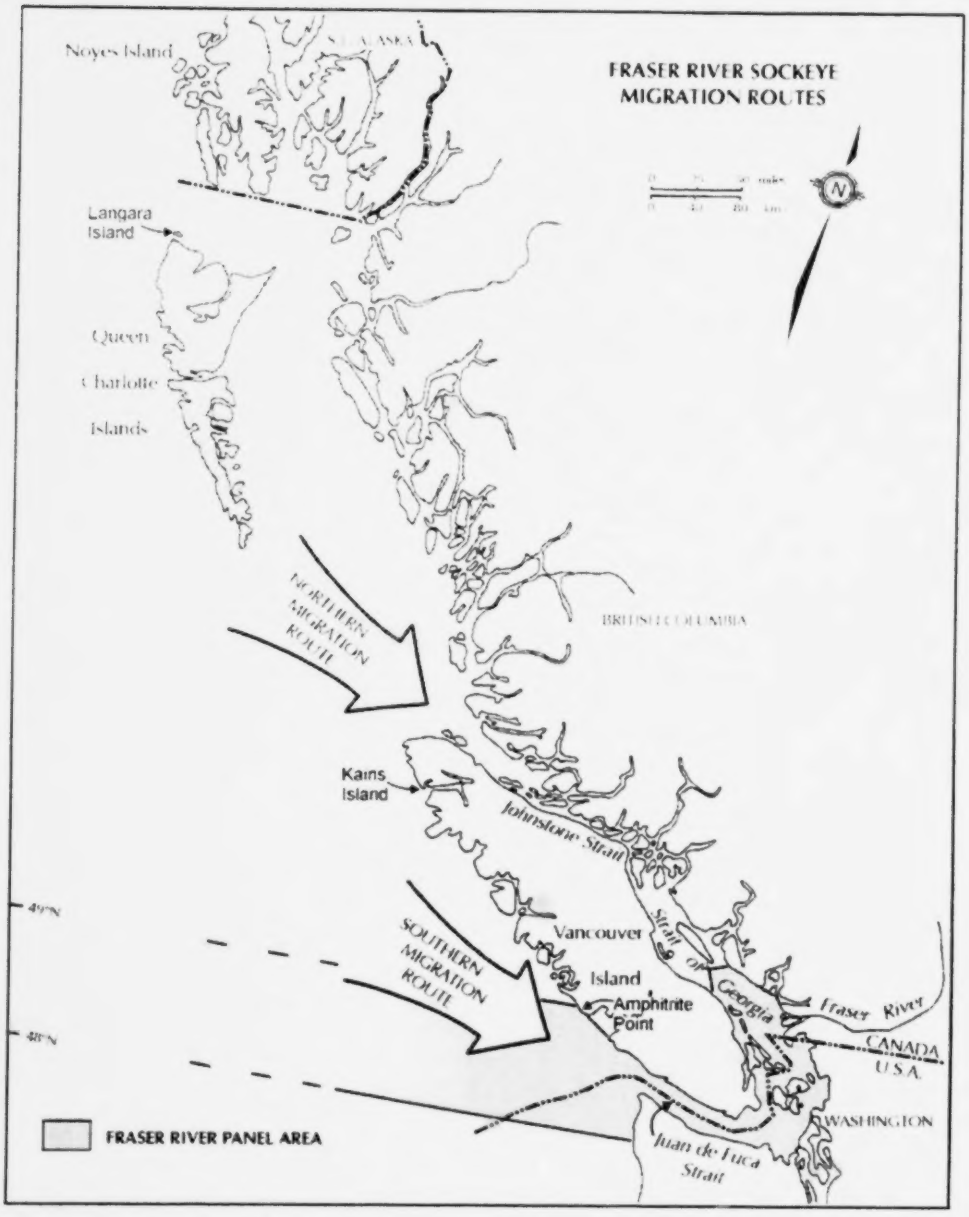

Figure 3. The northern (Johnstone Strait) and southern (Juan de Fuca Strait) routes for sockeye and pink salmon migrating to the Fraser River.

There was a bilateral desire to make changes to the historically applied in-season management process for the 2003 management season. The Commission Executive provided guidance to the Panel and PSC staff on making improvements to the Fraser River Panel process in a February 14, 2003 Commission agreement (Appendix D). Subsequently, at a meeting on June 4 and 5, the Panel approved a 2003 Management Plan that incorporated the modelled conservation constraints on Early Summer and Late-run stocks. Components of the Plan included the Guidelines to Address Late-run Concerns (Appendix B), the Principles and Constraints (Appendix E) and the Regulations (Appendix F).

In the pre-season Management Plan, fisheries in United States Panel Area waters were anticipated to start during the week of July 20 – 26 in Areas 4B, 5 and 6C, and during the week of July 27 – August 2 in Areas 6, 7 and 7A at the 50% probability level forecast. Fisheries in all United States Panel Areas were postponed by one week and fishing times were reduced, at the 75% probability level forecast. Canadian Panel Area fisheries were expected to open during the week of July 20 – July 26 for Area B purse seines, and during the week of July 27 to August 2 for Area H trollers and Area E gillnets at the 50% probability level forecast. At the 75% forecast probability level no commercial fishing was anticipated in Canadian Panel Area waters.

During the pre-season planning process, the Parties identified a number of conservation and management concerns. Species and stocks identified as being of concern to Canada included Fraser River Cultus Lake sockeye salmon, Sakinaw Lake sockeye salmon, Thompson River coho salmon, Lower and Upper Georgia Strait coho salmon, Johnstone Strait coho salmon, Summer-run chum salmon, Thompson River steelhead and West Coast Vancouver Island and Harrison River chinook salmon. The species and stocks identified by the United States included Hood Canal Summer-run chum and Puget Sound chinook salmon.

C. In-season Regulations

Between July 8 and September 26, the Fraser River Panel conferred 26 times by telephone to discuss run status and to enact in-season Orders (Appendix G) to regulate fisheries directed at the harvest of Fraser River sockeye and pink salmon in Panel Areas.

The environmental conditions for sockeye and pink salmon that migrated upstream of Mission in 2003 were satisfactory during most of the Early Stuart migration, but deteriorated during the Early Summer and Summer-run migration periods. Fraser River flow rates were near record lows from mid-July through early September, while water temperatures were at or above 17°C during this period and exceeded 19°C on many days. The high temperatures resulted in the Panel increasing the gross escapement requirements for Early Summer-run sockeye, and significant en route losses were expected for both Early Summer and Summer-run sockeye. True Late-run sockeye followed their migratory behaviour of recent years, and instead of delaying for an extended period (4-6 weeks) in the Strait of Georgia, they migrated with little delay into the Fraser River. As a consequence, in-river mortality of Late-run sockeye was again a concern.

The main events of the season are summarized on a weekly basis below. This synopsis focuses on analyses and recommendations by PSC staff, and on Panel decisions.

The first in-season meeting of the Panel occurred on July 8. PSC staff reviewed the Mission escapement-to-date of Early Stuart sockeye, and the relative abundance of Early Stuart, Early Summer and Lake Washington sockeye stocks in the Area 20 gillnet test fishery. Run-size assessments projected the Early Stuart return in the 20,000 to 40,000 fish range, with best estimates in the lower end of the range. The Panel adopted a provisional run-size estimate of 25,000 fish for the Early Stuart run. At the meeting, DFO provided run timing forecasts for Early Stuart (July 11 at Mission, four days later than normal) and Chilko runs (August 13 in Area 20, six days later than normal). They also provided a Johnstone Strait diversion rate estimate of 60% for Fraser River sockeye.

At a meeting on July 14, PSC staff noted that the daily sockeye passage in marine assessment areas was flat, with the runs building slowly relative to pre-season expectations. No updates to run sizes were provided. Environmental conditions in the Fraser River were reported to be favourable for successful sockeye migration, with current projections of en route mortality for Early Stuart sockeye in the 10% to 15% range, based on current temperature and discharge patterns. The final DFO forecast of the proportion of sockeye diverting through Johnstone Strait was 64%. On July 18, staff advised the Panel that marine test fishing indicators should increase in the coming days if Early Summer-run sockeye were returning at their forecasted run size. However, they were tracking at less than the 75% p level return, assuming that the return timing was six days later than normal. It was also reported that the absence of Summer-run sockeye in Area 20 was consistent with later than average timing. The Panel approved a formal run-size estimate of 25,000 fish for

Early Stuart sockeye, with a 50% arrival date (Area 20 timing) of July 3. Based on current assessment data, the Panel agreed to delay low impact fisheries scheduled for the following week until Summer-run sockeye abundance increased, and additional Early Summer-run escapement was obtained.

At the July 22 meeting, Early Summer-run sockeye continued to track later and smaller than forecast. The escapement of Summer-run fish past Mission was also tracking below expectations. In-river migration conditions were of concern, with Fraser River water temperatures predicted to increase to 19.2°C by July 26, which was within a temperature range where en route loss was expected. Little had changed on the following day, and the Panel agreed to delay fisheries that had been planned pre-season because of run-size uncertainties, lower than expected Early Summer-run escapement levels, and possible in-river migration difficulties related to high water temperatures.

By July 25, the status of the sockeye migration was more favourable. The Panel approved a run-size increase for Early Stuart sockeye from 25,000 to 30,000 fish. It was too early for the staff to generate provisional run-size estimates for Early Summer-run sockeye. However, the Panel was informed that Early Summer-run sockeye were tracking between four and eight days late, if the returning run was between the 50% and 75% probability level forecasts. Summer-run sockeye were tracking above the 50% probability forecast level assuming the pre-season run timing prediction was accurate. In response to staff evaluations, the Panel approved a low impact Treaty Indian drift gillnet fishery in Areas 4B, 5 and 6C. Canada reported that some low impact fisheries would be permitted in Canadian non-Panel waters.

At a meeting on July 28, DFO reported that the water temperature of the Fraser River at Qualark Creek had reached 19.1°C, and that the discharge measured at Hope was below 3,600 cms. Forecasts suggested the temperature would likely remain at or above 19°C for the next several days. This would increase en route loss estimates for Early Summer-run sockeye above those assumed during the pre-season planning process, when the first estimate from the MA model was available after August 1. The sockeye migration was building in marine area waters, as the Summer-run stock complex increased in abundance. The returns of early-timed, Early Summer and Summer-run sockeye were projected to be above their 50% probability level forecasts, with timing four days and six days later than normal, respectively. The following day, staff recommended a provisional Early Summer run-size estimate of 412,000 fish (50% probability level forecast), based on recent assessments that showed the Early Summer-run migration was consistent with pre-season abundance expectations. The Panel deferred a decision on the run size until staff could generate a more definitive estimate. However, based on the indications that the Early Summer run was tracking above pre-season expectations given the current run timing projections, the Panel approved additional fisheries. In United States waters, the drift gillnet fishery was extended, while both Treaty and All Citizen fisheries were approved in Areas 7 and 7A. In Canadian Panel waters, troll fisheries were scheduled in Areas 17, 18 and 29. Other fisheries either already underway or pending included an Area E assessment fishery, an Area D gillnet fishery, and various First Nations fisheries in marine waters and in the Fraser River.

At a meeting on August 1, DFO staff reported that the Fraser River water temperature at Qualark Creek had reached 19.7°C, and was forecast to exceed 20°C by the following week. PSC staff reported that migration indices had declined in recent days in Area 20 but increased in Johnstone Strait; which likely indicated a diversion rate shift. The diversion rate estimate was 60%, which was over twice the July 29 estimate of 23%. Mission hydroacoustic estimates showed an increase in sockeye abundance over the past three days, resulting from an increase in Summer-run escapements. Estimates of escapement past Mission exceeded levels projected during pre-season modelling for both Early Summer and Summer-run sockeye. Staff assessments indicated the run size of Early Summer-run sockeye (including the Scotch/Seymour stock-group) would reach 550,000 fish. The calculated MA adjustment at this run size, given current temperature conditions, was 147,000 fish. It was too early in the migration to assess Summer-run abundance, but it was tracking above the 50% probability level forecast, assuming normal timing. The Panel approved the run-size estimate of 550,000 Early Summer sockeye and the MA adjustment. Panel Area fisheries were approved in United States waters in Areas 4B, 5 and 6C, and in Areas 6, 7 and 7A, in response to the increasing Johnstone Strait diversion rate. In Canada, an Area E gillnet fishery was approved for Area 29, while Area H troll fisheries were on-going in Areas 17, 18 and 29. Area D gillnet and Area B purse seine fisheries (Johnstone Strait only) were also announced.

Canada did not request an Area B purse seine fishery in Area 20 in recognition of the low daily abundances migrating into United States waters as a result of the increased Johnstone Strait diversion rate.

At an August 4 meeting, a DNA analysis of a sample collected from an Area 20 purse seine test fishery on August 2 showed stock proportions of 10% Birkenhead and 20% True Late-run sockeye. These stock proportions greatly exceeded those anticipated during pre-season planning. This suggested that either the abundance of Summer-run sockeye was lower than forecast, or Late-run sockeye were earlier or more abundant than forecast. The data suggested that early-timed Early Summer-run sockeye were declining in marine waters, while additional abundance was expected from the later-timed Scotch/Seymour group. Staff recommended to the Panel that the run size of 550,000 Early Summer sockeye be maintained. Summer-run sockeye were tracking two days later than normal at the 50% probability level forecast. The estimated diversion rate had declined slightly to 55%.

On August 5, Mission escapement estimates were closely tracking marine abundance indicators, with a total escapement of 748,000 fish (29,000 Early Stuart, 239,000 Early Summer, 447,000 Summer and 32,000 Late-run sockeye). However, staff reported that differences between the echo-sounding estimates at Mission (i.e., split-beam and single beam) required caution regarding the scheduling of additional Area E gillnet fisheries. A recent DNA analysis from the Fraser River confirmed that Late-run sockeye had begun migrating past Mission. A second DNA analysis from an August 2, Area 12 purse seine sample showed only 5% Late-run fish, suggesting a harvest window that could result in significant Summer-run sockeye harvest with a small by-catch of Late-run fish. The Panel approved a reefnet fishery in Area 7, and Canadian non-Panel Area fisheries were announced for Area H troll, Area D gillnet and Area B purse seine (Johnstone Strait only) fisheries.

On August 8, the Panel was apprised of increasing Late-run stock proportions in recent DNA samples collected from the Area 20 purse seine test fishery (August 5, 15% True Late-run sockeye), Area 12 commercial purse seine fishery (August 4, 24% True Late sockeye), and Area 29 gillnet test fishery (August 1-4, 10% True Late sockeye). Sockeye escapement estimates at Mission totalled 858,000 fish, including 29,000 Early Stuart, 263,000 Early Summer, 540,000 Summer and 26,000 Late-run fish. Abundance estimates were encouraging, with Summer-run sockeye tracking at or above the 50% probability level forecast, and Late-run sockeye tracking above the 50% probability level forecast, assuming normal timing. The diversion rate over the previous five days was approximately 73%. Panel Area fisheries were approved for Treaty Indian fishers in United States Areas 4B, 5 and 6C, and in Areas 6, 7 and 7A. A Non-Indian reefnet fishery was scheduled for Areas 7 and 7A. In Canadian Panel waters, an Area B purse seine assessment fishery was approved for Area 20 (and for Area B purse seines in Area 12), along with an extension to the Area H troll fishery in Areas 17, 18, and 29.

By August 11, high water temperatures in the Fraser River were moderating, but still above normal at 18.9°C. Escapement estimates were tracking close to expectations, assuming the run was returning close to the 50% probability level forecast, with Early Summer-run sockeye at 317,000 fish, Summer-run sockeye at 753,000 fish and Late-run sockeye at 56,000 fish. Catch estimates of Fraser River sockeye were summarized as follows: Canadian commercial – 834,000 fish; United States commercial – 111,000 fish; and non-commercial - 197,000 fish. United States fisheries had caught 10,800 True Late-run sockeye, leaving 29,300 in their allocation of 40,100 fish. Canadian fisheries had caught 129,500 True Late-run sockeye, leaving a balance of 135,500 from their allocation of 265,000 fish. The migration profile of Summer-run sockeye was fairly flat, and now appeared to be three to four days earlier than was assumed during pre-season planning. Model estimates for Summer-run sockeye ranged from 3,000,000 to 3,900,000 fish, bracketing the 50% probability level forecast of 3,360,000 fish. The Panel approved a provisional Summer-run run-size estimate of 3,360,000 fish. Late-run sockeye were tracking above the 50% probability level forecast, but staff advised the Panel that it was too early to generate run-size estimates for Late-run sockeye. Approximately one-third of Late-run sockeye were projected to be delaying in the Strait of Georgia. Canada announced plans for an Area E gillnet fishery in the Fraser River for later in the week. At a meeting on August 12, extensions were announced for on-going Treaty Indian fisheries in United States Panel Areas 4B, 5, and 6C and Areas 6, 7, and 7A. Non-Indian fisheries were also approved in Areas 7 and 7A for gillnets, purse seines and reefnets. In addition

to the previously approved Area E gillnet fishery, the Panel approved an Area H troll fishery in Areas 18 and 29. Staff informed the Panel that the hydroacoustics program for pink salmon may not be conducted and other programs may be terminated early, due to a shortfall in United States funding of PSC Treaty programs.

On August 15, the Panel was updated on the status of the PSC funding shortfall and was informed that staff members were identifying potential areas for program reductions. Recent test fishing, escapement and racial analysis data indicated that Summer-run and Late-run sockeye were not increasing sufficiently to exceed their respective 50% probability level forecasts. However, Birkenhead sockeye were tracking above their 50% probability level forecast. The estimated proportion of Late-run sockeye delaying in the Strait of Georgia was 24%. Staff informed the Panel that they would provide an estimate of the Mission 50% migration date for Late-run sockeye within the next week, however, current indications suggested a significantly earlier date than was assumed in pre-season planning. This would result in a reduction below the 25% exploitation rate limit for Late-run sockeye. After discussion of the remaining Late-run TAC available for United States fisheries, the Panel approved Treaty Indian fisheries in Areas 4B, 5 and 6C, and in Areas 6, 7, and 7A. Non-Indian fisheries were also approved for gillnets, purse seines and reefnets in Areas 7 and 7A.

At a meeting on August 19, PSC staff noted that the temperature of the Fraser River at Qualark Creek remained above normal at 19.4°C, and the MA prediction for en route loss of Summer-run sockeye was higher than previously estimated. Estimates of sockeye escapements past Mission totalled 1,770,000 fish, including 369,000 Early Summer-run, 1,193,000 Summer-run and 179,000 Late-run sockeye. These totals comprised 87%, 76% and 16% of each run-timing group's respective gross escapement target. The Panel approved run-size estimates for both Early Summer (585,000 fish) and Summer-run (3,300,000 fish) sockeye. Staff also advised the Panel to retain the 50% probability level forecast of abundance for Late-run sockeye. An estimated 24% of Late-run sockeye were delaying in the Strait of Georgia. Staff advised the Panel that it would revise the Late-run 50% migration date at Mission away from the pre-season forecast at the next Panel meeting. The result would be a reduction in the maximum exploitation rate for Late-run sockeye from 25% to 15%. Under the pre-season run-size estimate of 1,319,000 fish, the TAC would drop to 117,000 Late-run sockeye. Based on current catch estimates, this would result in both Canada and the United States exceeding their catch ceilings for Late-run sockeye by 57,000 fish and 15,000 fish, respectively.

On August 22, Fraser River water temperatures were high (19°C), and were projected to remain above 18°C for at least the next ten days. Late-run sockeye currently migrating in the Fraser River were experiencing very warm water temperatures relative to temperatures they would experience during their normal migration period. Assessments of Summer-run sockeye indicated that their migration continued to be fairly flat and extended, and the absence of an increasing build-up in their daily migration may result in a slight reduction in their estimated run size. Staff reported that the Late-run migration should remain strong for another few weeks. The staff recommended the Panel adopt the 50% probability level forecast of True Late-run abundance (1,319,000 fish) as a provisional run-size estimate. Estimates of the proportion of Late-run sockeye delaying in the Strait of Georgia ranged from 13% to 18%. Staff advised that the revised estimate of 50% arrival timing at Mission was August 27, and there was only a 10% chance that the run would be later than September 2. An estimated en route loss of 84% Late-run sockeye was predicted from the MA model using the August 27 migration date. According to the pre-season management plan, the revised Late-run sockeye migration date reduced the exploitation rate limit for True Late-run sockeye to 15%. The result of the revision was that Canada had exceeded it's Late-run allocation of 155,000 fish by 89,000 fish, and the United States had exceeded it's share of 19,000 fish by 13,000 fish. Staff reported that purse seine test fishing catches of pink salmon had been very high in Areas 20 and 12, indicating a large abundance of pink salmon in marine approach areas. The estimate of pink salmon escapement past Mission was 251,000 fish, indicating that Fraser River pink salmon were entering the river with little or no delay. The Panel approved a Non-Treaty reefnet fishery in Areas 7 and 7A directed at pink salmon, with non-retention of sockeye salmon.

On August 26, staff reported that the abundance of sockeye migrating through both marine approach areas was declining. However, the escapement of sockeye past Mission had remained at

expected levels over the past several days. Present estimates of Summer-run abundance ranged from 3,100,000 to 3,300,000 fish, and the Panel was informed that the run would likely not exceed 3,200,000 fish. Estimates of True Late-run sockeye abundance ranged from 1,200,000 to 1,350,000 fish, bracketing the current run size of 1,319,000 fish. It was estimated that approximately 225,000 Late-run sockeye were delaying in the Strait of Georgia, and the estimated 50% arrival timing of Late-run sockeye at Mission was still August 27. Test fishing catches of pink salmon in marine areas had declined from the prior peak levels, but it was anticipated that the pink salmon migration would continue over the next couple of weeks. Pink salmon catches totalled 648,000 fish, with a Canadian commercial harvest of 407,000 fish, a United States catch of 191,000 fish and a non-commercial catch of 50,000 fish. Staff reported that it was too early to provide the Panel with an in-season estimate of Fraser River pink salmon abundance. The United States highlighted the issue of both countries having exceeded their respective share of the Late-run TAC, and asked when Canada would cease it's non-Panel Area fisheries that were targeting sockeye. It was noted that these fisheries were contrary to pre-season fishing arrangements, and had the potential to adversely impact future United States harvest opportunities on Late-run sockeye. Canada announced that it would draft a formal reply to the concerns and questions posed by the United States. The Panel approved the continuation of the Non-Treaty reefnet fishery directed at pink salmon (non-retention of sockeye) in Areas 7 and 7A.

At a meeting on August 29, it was reported that purse seine test fishing catches of sockeye had been low in Area 20 and higher in Johnstone Strait. This supported previous estimates of a high diversion rate of Fraser sockeye through Johnstone Strait. Estimates of sockeye escapements past Mission totalled 2,884,000 fish, including 370,000 Early Summer, 1,905,000 Summer and 580,000 Late-run fish. The gross escapement goal for Summer-run sockeye had been exceeded by 21%. Staff advised the Panel that the run size of Summer-run sockeye was unlikely to exceed 3,200,000 fish, but the Panel chose to retain the current estimate of 3,300,000 fish. The Panel approved a provisional run size of 322,000 Birkenhead sockeye (50% probability level forecast), and agreed with staff advice to retain the run-size estimate for True Late-run sockeye at 1,319,000 fish. An estimated 215,000 True Late-run sockeye were delaying in the Strait of Georgia. The estimated 50% arrival timing of Late-run sockeye at Mission was revised to August 31, resulting in an MA estimate of 78%. Pink salmon catches in the Area 20 purse seine test fishery had declined in recent days but increased in the Area 12 test fishery, indicating an increasing diversion rate through Johnstone Strait. Large escapements of Fraser River pink salmon had been estimated at Mission, suggesting a continuation of the early upstream migration behaviour. The estimated catch of Fraser River pink salmon was 669,000 fish, while the migration to date through the marine assessment areas was approximately 15,300,000 fish. The Panel approved Treaty Indian fisheries in Areas 4B, 5, and 6C and Areas 6, 7, and 7A, with non-retention of sockeye by purse seines and with the East Point Roberts to East Point Light Line in effect. Non-Treaty fisheries in Areas 7 and 7A were approved for purse seines and reefnets, with non-retention of sockeye and with the East Point Roberts to East Point Light Line in effect. Canada announced tentative plans for pink salmon directed fisheries for purse seines and trollers, with non-retention of sockeye, in non-Panel waters. The United States reiterated it's request for a letter from Canada documenting Canada's rationale for the continuation of fisheries directed at sockeye in the Fraser River after the Late-run TAC had been exceeded.

By September 2, marine abundances of Fraser River sockeye were declining rapidly. Estimates of sockeye escapement past Mission totalled 3,123,000 fish, including 2,016,000 Summer-run (128% of the goal) and 708,000 Late-run (including Birkenhead) sockeye (54% of the goal). The total catch of sockeye in all fisheries had reached 2,100,000 fish. Assessments of Summer-run abundance indicated the final in-season run size would be close to 3,200,000 fish. Late-run abundance estimates ranged from 1,300,000 to 1,340,000 fish, while estimates for Birkenhead sockeye were close to the current run-size estimate of 322,000 fish. The current estimate of the number of pink salmon that had migrated past marine assessment fisheries was 17,000,000 fish, with the majority continuing to migrate via Johnstone Strait. A strong migration of pink salmon continued at Mission, suggesting few Fraser River pink salmon were exhibiting their normal delay behaviour. There were no fisheries scheduled in Panel waters.

On September 5, it was reported that the escapement of Summer-run sockeye had reached 2,043,000 fish, while 210,000 Birkenhead sockeye and 615,000 True Late-run sockeye had also escaped. The estimated catch of sockeye in all fisheries had increased to 2,168,000 fish. Johnstone

Strait purse seine test fishing catches of pink salmon continued to be large, generating a cumulative passage estimate of approximately 20,300,000 Fraser River pink salmon (through Area 12) to September 4, and an estimated diversion rate of 70%. The Panel adopted the 25% probability level forecast, rounded to 25,000,000 fish, as a provisional run-size estimate. The Panel approved a Treaty Indian fishery in Areas 6, 7, and 7A, with non-retention of sockeye salmon, and the East Point Roberts to East Point Light Line in effect. In addition, Non-Treaty purse seine and reefnet fisheries were approved for Areas 7 and 7A, with non-retention of sockeye salmon, and the East Point Roberts to East Point Light Line in effect. An Area 18 fishery for Area H troll fishers was also approved, with non-retention of sockeye salmon. The Panel approved relinquishment of regulatory control in Area 20 and Areas 4B, 5, and 6C effective 12:01 a.m. September 6.

At a meeting on September 9, it was reported that sockeye continued to migrate in low numbers. The escapement of sockeye past Mission totalled 2,070,000 Summer-run, 224,000 Birkenhead and 614,000 Late-run sockeye. In addition, Henry's Bridge index counts of sockeye were reported to be consistent with Chilko River abundance projections from Mission escapement estimates. Run-size estimates were 3,250,000 to 3,350,000 fish for Summer-run sockeye, 400,000 fish for Birkenhead and 1,265,000 for Late-run sockeye. The migration of pink salmon continued to be strong in both marine approach areas and in the Fraser River. The diversion rate estimate was unchanged at 70%. The catch of Fraser River pink salmon to date was estimated at 931,000 fish, including a Canadian commercial harvest of 479,000 fish, a United States commercial harvest of 389,000 fish and a non-commercial harvest of 63,000 fish. The accounted abundance of Fraser pink salmon through the marine approach areas through September 8 was approximately 23,000,000 fish, and it was expected that the final abundance would reach or exceed the provisional run-size estimate of 25,000,000 fish. The Panel approved a Treaty Indian fishery in Areas 6, 7, and 7A, with non-retention of sockeye salmon and the East Point Roberts to East Point Light Line in effect. An Area 18 fishery for Area H troll fishers was extended, with non-retention of sockeye salmon remaining in effect.

An updated review of sockeye escapement was provided to the Panel on September 12, and included a Summer-run escapement of 2,083,000 fish (132% of the goal) and a combined Late-run escapement, including Birkenhead, of 893,000 fish (68% of the goal). The run size of Summer-run sockeye was projected to reach approximately 3,250,000 fish, along with 375,000 Birkenhead sockeye and 1,260,000 True Late-run fish. The migration of Fraser River pink salmon was declining in marine approach areas. Recent catches had increased the Fraser River pink salmon catch to 1,267,000 fish, including catches in Canadian commercial fisheries of 627,000 fish, 566,000 fish in United States commercial fisheries and 74,000 fish in non-commercial fisheries. The pink salmon run-size estimate was unchanged at 25,000,000 fish, with large uncertainty associated with the estimate. The Panel approved extensions to Treaty Indian fisheries in Areas 6, 7, and 7A, with non-retention of sockeye salmon and the Iwersen's Dock Line in effect. In addition, Non-Treaty purse seine and reefnet fisheries were approved for Areas 7 and 7A, with non-retention of sockeye salmon and the Iwersen's Dock Line in effect.

On September 16, the Panel received updates on the marine tagging study using radio telemetry tags applied to Late-run and co-migrating sockeye, and on physiological studies being conducted on Late-run sockeye. By September 19, sockeye escapements past Mission were estimated as follows: 2,084,000 Summer-run fish, 243,000 Birkenhead sockeye and 864,000 True Late-run sockeye. The accounting-based estimate for Summer-run sockeye was 3,226,000 fish, for Birkenhead it was 370,000 fish, and for True Late-run sockeye it was 1,175,000 fish. The final run-size estimate for True Late-run sockeye was 1,200,000 fish. The marine migration of pink salmon was declining rapidly. The catch of Fraser River pink salmon was estimated at 1,580,000 fish, with Canadian and United States commercial fisheries harvesting 733,000 and 772,000 fish, respectively. An additional 75,000 pinks had been caught in non-commercial fisheries. The Panel agreed to relinquish regulatory control in Areas 6, 6A, and 7, effective 12:01 a.m., September 20. They also agreed to relinquish regulatory control in Area 7A, southerly and easterly of the Iwersen's Dock Line, effective 12:01 a.m. September 20. The United States announced that some funding had been secured and would be sufficient to keep the PSC operational for the near future.

The final in-season Panel meeting was held on September 26. The Panel approved accounting based run-size estimates as follows: 3,200,000 Summer-run sockeye, 375,000 Birkenhead sockeye

and 1,200,000 Late-run sockeye. The final in-season catch of Fraser River sockeye was estimated at 2,242,000 fish. Estimates of sockeye escapement past Mission were also provided: Early Stuart – 29,000 fish, Early Summer – 370,000 fish, Summer – 2,087,000 fish, Birkenhead – 249,000 fish, and True Late-run sockeye – 871,000 fish. The Panel approved a final in-season run-size estimate of 26,000,000 Fraser River pink salmon, with a 50% arrival timing through Area 20 of August 25. The estimated catch of Fraser River pink salmon was 1,717,000 fish, including a Canadian commercial catch of 829,000 fish, a United States commercial catch of 773,000 fish and a non-commercial catch of 115,000 fish.

Fishing times and relinquishment dates for commercial net fisheries in Canadian and United States Panel Areas are summarized in Tables 3 and 4.

Table 3. Actual fishing times (days) in major Canadian fisheries in the Fraser River Panel Area in 2003.

	Area 20		Area 29	Areas 18, 29
Date	Purse Seine	Gillnet	Gillnet	Troll
Jun.30-Jul.20	Closed	Closed	Closed	Closed
Jul.21-Jul.27	Closed	Closed	Closed	Closed
Jul.28-Aug.3	Closed	Closed	Closed	5 2
Aug.4-Aug.10	Closed	Closed	1	7
Aug.11-Aug.17	1 1	Closed	1	3
Aug.18-Aug.24	Closed	Closed	Closed	Closed
Aug.25-Aug.31	Closed	Closed	Closed	Closed
Sep.1-Sep.7	Closed	Closed	Closed	Closed
Sep.8-Sep.14	Relinq.	Relinq.	Closed	Closed
Sep.15-Sep.21			Closed	Closed
Sep.22-Sep.28			Closed	Closed
Sep.29-Oct.5			Closed	Closed
Oct.6-Oct.12			Closed	Relinq.
Oct.13-Oct.19			Relinq.	
Total	1	0	2	15

1 A 12 hour purse seine assessment fishery was conducted in Area 20 on August 11.

2 The troll fishery was open continuously from July 30 to August 13. However the effort in Panel waters was very low and the catch total for the season was 33 sockeye.

Table 4. Actual fishing times (hours) in major United States net fisheries in the Fraser River Panel Area in 2003.

	Treaty Indian		Non-Indian		
	Areas	Areas	Areas 7 and 7A		
Date	4B, 5, 6C	6, 7, 7A	Purse Seine	Gillnet	Reefnet
Jun.30-Jul.20	Closed	Closed	Closed	Closed	Closed
Jul.21-Jul.27	60	Closed	Closed	Closed	Closed
Jul.28-Aug.3	168	24	12	12	44
Aug.4-Aug.10	168	94.5	32	32	16
Aug.11-Aug.17	168	120	32	34	48
Aug.18-Aug.24	60	31.5	13	16	48
Aug.25-Aug.31 *	Closed	Closed	Closed	Closed	112
Sep.1-Sep.7 *	72	40	48	Closed	112
Sep.8-Sep.14 *	Relinq.	107	46	Closed	110
Sep.15-Sep.21 *		116	70	Closed	70
Sep.22-Sep.28		Relinq.	Relinq.	Relinq.	Relinq.
Sep.29-Oct.5					
Oct.6-Oct.12					
Total	696	533	253	94	560

* Non-retention of sockeye during pink salmon-directed fisheries.

Table 5. Fishery catches, spawning escapement and total run of Fraser River sockeye salmon during the 2003 fishing season, by country and area.

	Number of Fish	% of Run
CANADA		
COMMERCIAL CATCH		
Fraser River Panel Area		
Areas 121-124 Troll	0	
Area 20 Net	0	
Areas 17-18 and 29 Troll	0	
Area 29 Net	249,000	
Total	249,000	5.1%
Non-Panel Areas		
Areas 1-10 Troll and Net	0	
Areas 11-16 Troll and Net	737,200	
Areas 124-127 Troll	0	
Total	737,200	15.1%
Selective Fisheries	50,000	1.0%
Commercial Total	1,036,200	21.2%
FIRST NATIONS CATCH		
Marine Areas - food, social, ceremonial		
Areas 12-16, 18, 20, and 123-126	217,400	
Area 29-1 to 7	100	
Total	217,500	4.4%
Fraser River - food, social, ceremonial		
Below Sawmill Creek	423,900	
Above Sawmill Creek	163,100	
Total	587,000	12.0%
First Nations Total	804,500	16.4%
NON-COMMERCIAL CATCH		
ESSR Fishery *	10,000	
Charter	600	
Recreational Fishery - Marine	3,500	
Recreational Fishery - River	73,600	
Non-Commercial Total	87,700	1.8%
CANADIAN TOTAL	1,928,400	39.4%
UNITED STATES		
COMMERCIAL CATCH		
Fraser River Panel Area		
Areas 4B, 5 and 6C Net	34,500	
Areas 6 and 7 Net	113,700	
Area 7A Net	95,100	
Total	243,300	5.0%
Non-Panel Areas		
Alaska Net	67,700	1.4%
Commercial Total	311,000	6.3%
NON-COMMERCIAL CATCH		
Ceremonial & Subsistence	400	0.0%
UNITED STATES TOTAL	311,400	6.4%
TEST FISHING		
COMMISSION		
Areas 20 and 29 Test Fishing	40,400	
Area 7 Test Fishing	1,200	
Commission Total	41,600	0.8%
CANADA		
Areas 12 and 13 Test Fishing	65,600	1.3%
TEST FISHING TOTAL	107,200	2.2%
TOTAL CATCH	2,347,000	47.9%
SPAWNING ESCAPEMENT	1,988,000	40.6%
DIFFERENCE BETWEEN ESTIMATES **	563,000	11.5%
TOTAL RUN	4,898,000	100.0%

* Harvest of Weaver Creek sockeye in the terminal area that were Excess Salmon to Spawning Requirements (ESSR).

** [Mission escapement + First Nations catch below Mission] - [total Fraser River First Nations catch, in-river recreational catch & spawning escapement].

V. CATCH SUMMARY

A. Sockeye Salmon

The total return of 4,898,000 Fraser River sockeye salmon in 2003 (Table 5) was 11% under the pre-season 50% probability level forecast (5,502,000 fish), and 56% above the 75% probability level forecast (3,141,000 fish). In the previous twelve returns on the 2003 cycle line (1955 to 1999), sockeye abundance has ranged from a low of 2,747,000 fish (1955) to a high of 12,411,000 fish (1991) (Figure 4). The 2003 return was below the long-term average for the cycle of 5,758,000 fish. The commercial exploitation rate (27.5%) was the second lowest for this cycle over the period of record (i.e., since 1955, with the lowest commercial exploitation rate of 2.4% recorded in 1999).

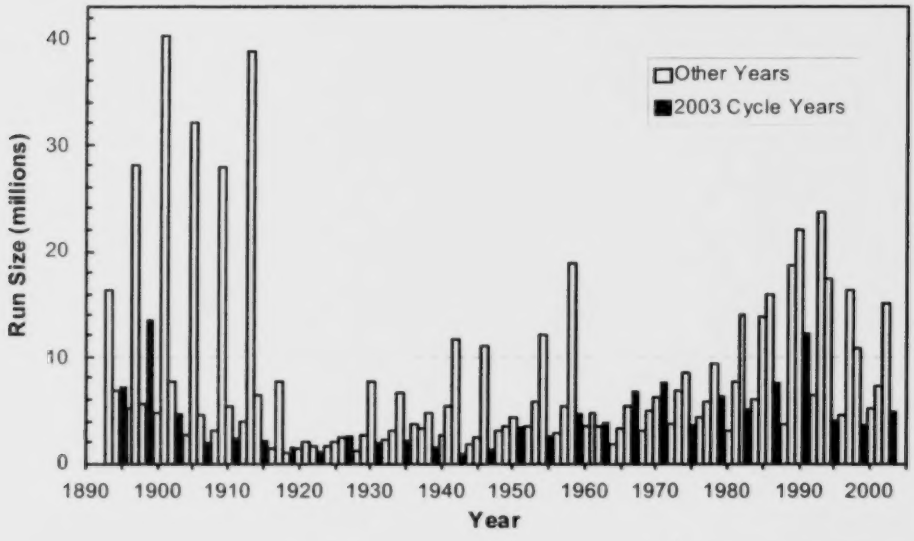

Figure 4. Total run sizes of Fraser River sockeye salmon between 1893-2003. Returns on the 2003 cycle are emphasized.

Catches of Fraser River sockeye salmon in all fisheries totalled 2,347,000 fish (Table 5). Canadian catches of 1,928,000 sockeye included a commercial harvest of 1,036,000 fish (including a selective fishery catch of 50,000 fish), First Nations catch of 805,000 fish, ESSR catch of 10,000 fish, and miscellaneous non-commercial catches of 78,000 sockeye. United States fishers caught 311,000 fish, almost entirely comprised of commercial harvest. In addition to the catches outlined above, test fisheries authorized by the Fraser River Panel landed 107,000 sockeye.

i. Canada

The commercial catch of 1,036,000 Fraser sockeye in Canada included 249,000 fish in Panel Areas and 737,000 fish in non-Panel Areas, while the selective fishery catch was 17,000 fish in Panel Areas and 33,000 fish in non-Panel Areas. Non-commercial catches included DFO charter catches of 600 fish, an ESSR catch of 10,000 fish and a recreational catch of 77,000 Fraser sockeye.

Canadian commercial catches of Fraser River sockeye salmon by gear type and area are presented in Table 6. Area B (southern) purse seines caught 487,000 sockeye (47% of the Canadian commercial catch), Area D (Johnstone Strait) gillnets caught 167,000 sockeye (16% of the commercial harvest) and Area E (Fraser River) gillnets caught 259,000 sockeye (25% of the commercial share). Within the troll gear sector, Area G (outside) trollers did not have a sockeye allocation in 2003, while the Area H (inside) trollers caught 124,000 sockeye (12% of the commercial share). Weekly catches in Canadian fishing areas are shown in Appendix H (Tables 1-

4). Selective fishery catches totalled 50,000 fish including 32,000 by Area B (southern) purse seines, 8,200 by Area D (Johnstone Strait) gillnets, and 9,600 by Area E (Fraser River) gillnets.

First Nations fishers caught 805,000 sockeye, including 218,000 fish harvested in marine fisheries and 587,000 fish harvested in the Fraser River (Appendix H, Table 5). The catch distribution in the Fraser River was as follows: 204,000 fish in the Fraser River below Mission; 220,000 fish in the Fraser River between Mission and Sawmill Creek; and 163,000 fish in the mainstem of the Fraser River and in tributaries upstream of Sawmill Creek.

Table 6. Canadian commercial catches of Fraser River sockeye salmon by gear type, license designation and statistical area during the 2003 fishing season. *

	Purse Seine		Gillnet			Troll			
Areas	Area A	Area B	Area C	Area D	Area E	Area F	Area G	Area H	Total
1-10	0		0			0			0
11-16		454,400		158,900	0		0	123,900	737,200
121-127		0		0			0		0
20		0			0		0		0
17, 18, 29		0			249,000			0	249,000
Selective	0	32,200	0	8,200	9,600	0	0	0	50,000
Total Catch	0	486,600	0	167,100	258,600	0	0	123,900	1,036,200
% of Catch	0.0%	47.0%	0.0%	16.1%	25.0%	0.0%	0.0%	12.0%	100.0%

* DFO post-season catch estimates.

ii. United States

Catches of Fraser River sockeye in the United States totalled 311,000 fish in 2003, 243,000 fish in Panel Area commercial fisheries, 68,000 in non-Panel Area commercial fisheries and less than 500 fish in Ceremonial and Subsistence fisheries (Table 7). Treaty Indian fishers harvested 160,000 fish in commercial fisheries, including a catch of 35,000 fish in Areas 4B, 5 and 6C, and 125,000 fish in Areas 6, 7 and 7A. Non-Indian catches totalled 84,000 sockeye, including 48,000 fish by purse seines, 28,000 fish by gillnets, and 8,000 sockeye by reefnets. Weekly catches of Fraser River sockeye salmon in United States Panel Areas are shown in Appendix H (Table 6).

Table 7. United States commercial catches of Fraser River sockeye salmon by user group, gear type and statistical area during the 2003 fishing season. *

Areas	Ceremonial & Subsistence	Purse Seine	Gillnet	Reefnet	Total
Treaty Indian					
4B, 5 and 6C	400	0	34,500	0	34,900
6 and 7	0	35,200	32,700	0	67,900
7A	0	13,800	43,100	0	56,900
6, 7 and 7A Total	0	49,000	75,800	0	124,800
% of Catch	0.0%	39.3%	60.7%	0.0%	100.0%
Total Catch	400	49,000	110,300	0	159,700
% of Catch	0.3%	30.7%	69.1%	0.0%	100.0%
Non-Indian					
7	0	25,600	12,600	7,600	45,800
7A	0	22,700	15,500	0	38,200
Total Catch	0	48,300	28,100	7,600	84,000
% of Catch	0.0%	57.5%	33.5%	9.0%	100.0%
United States					
Panel Area Total	400	97,300	138,400	7,600	243,700
Alaska (District 104) Catch					67,700
Total Catch					311,400

* Washington catches from Washington Department of Fish and Wildlife "soft system".

Table 8. Fishery catches, spawning escapement and total run of Fraser River pink salmon during the 2003 fishing season, by country and area.

		Number of Fish	% of Run
CANADA			
COMMERCIAL CATCH			
Fraser River Panel Area			
Areas 121-124 Troll	*	600	
Area 20 Net		4,400	
Areas 17-18 and 29 Troll		1,000	
Area 29 Net		18,100	
	Total	24,100	0.1%
Non-Panel Areas			
Areas 1-10 Troll and Net		0	
Areas 11-16 Troll and Net		797,100	
Areas 124-127 Troll	*	100	
	Total	797,200	3.1%
Selective Fisheries		11,900	0.0%
	Commercial Total	833,200	3.2%
FIRST NATIONS CATCH			
Marine Areas - food, social, ceremonial			
Areas 12-16, 18, 20, and 123-126		0	
Area 29-1 to 7		0	
	Total	0	0.0%
Fraser River - food, social, ceremonial			
Below Sawmill Creek		293,900	
Above Sawmill Creek		2,200	
	Total	296,100	1.1%
	First Nations Total	296,100	1.1%
NON-COMMERCIAL CATCH			
Charter		200	
Recreational Fishery - Marine		77,000	
Recreational Fishery - River		9,400	
	Non-Commercial Total	86,600	0.3%
	CANADIAN TOTAL	1,215,900	4.7%
UNITED STATES			
COMMERCIAL CATCH			
Fraser River Panel Area			
Areas 4B, 5 and 6C Net & Troll		37,600	
Areas 6 and 7 Net		598,900	
Area 7A Net		135,300	
	Total	771,800	3.0%
Non-Panel Areas			
WA, OR and CA Troll		0	0.0%
	Commercial Total	771,800	3.0%
NON-COMMERCIAL CATCH			
Recreational		38,900	
Ceremonial & Subsistence		100	
	Non-Commercial Total	39,000	0.2%
	UNITED STATES TOTAL	810,800	3.1%
TEST FISHING			
COMMISSION			
Areas 20 and 29 Test Fishing		28,700	
Area 7 Test Fishing		0	
	Commission Total	28,700	0.1%
CANADA			
Areas 12 and 13 Test Fishing		13,600	0.1%
	TEST FISHING TOTAL	42,300	0.2%
	TOTAL CATCH	2,069,000	8.0%
SPAWNING ESCAPEMENT	**	23,931,000	92.0%
	TOTAL RUN	26,000,000	100.0%

* Troll catches in Area 124 are divided between Panel and non-Panel areas.

** DFO did not enumerate pink salmon escapements in 2003, so escapement calculated by subtracting total catch from in-season run-size estimate (26,000,000 fish).

B. Pink Salmon

The estimated total return of 26,000,000 Fraser River pink salmon (Table 8) was approximately 50% larger than the pre-season 50% probability level forecast of 17,273,000 fish. The run was the largest on record for Fraser River pink salmon (documentation of their run sizes began in 1959) (Figure 5), and exceeded the brood year return of 21,293,000 fish by approximately 22%. Catches in all fisheries totalled 2,069,000 fish: 1,216,000 in Canadian, 811,000 in United States and 42,000 in Panel-approved test fisheries.

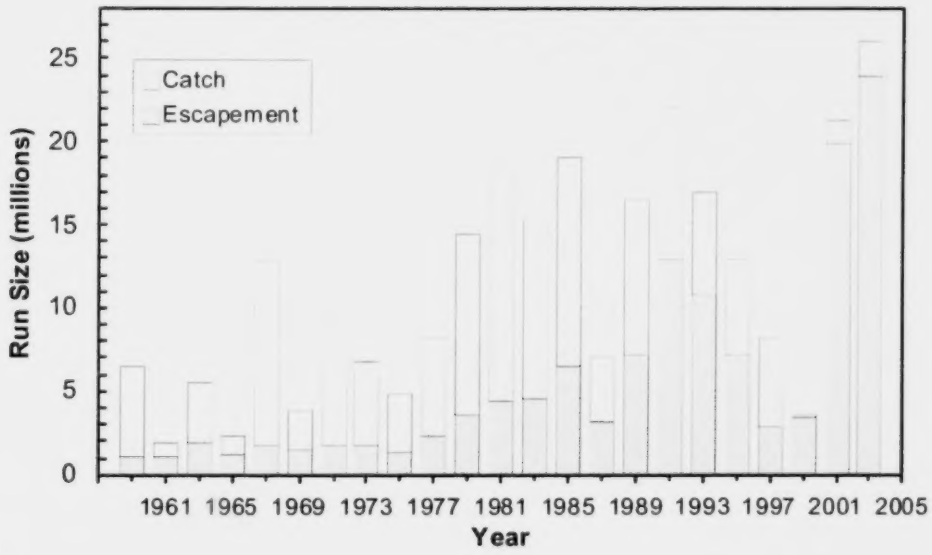

Figure 5. Total catch, escapement and run size of Fraser River pink salmon between 1959-2003.

i. Canada

A total of 1,216,000 Fraser River pink salmon were harvested in commercial, First Nations and non-commercial fisheries in Canada (Table 8). The commercial catch was 833,000 fish, including 24,000 fish in Panel Areas, 797,000 fish in non-Panel Areas and 12,000 fish in selective fisheries.

Canadian commercial catches of Fraser River pink salmon by gear type and area are presented in Table 9. Area B (southern) purse seines caught 722,000 Fraser River pink salmon (87% of the Canadian commercial catch), Area D (Johnstone Strait) gillnets caught 16,000 pinks (2% of the commercial harvest), and Area E (Fraser River) gillnets caught 18,000 pinks (2% of the commercial harvest). Within the troll gear sector, Area G (outside) trollers caught 600 pinks, and Area H (inside) trollers caught 77,000 pinks (9% of the commercial share). Weekly catches in Canadian fishing areas are shown in Appendix H (Tables 7-10).

First Nations fishers caught 296,000 pink salmon in the Fraser River and there was no reported catch by this group in marine areas (Appendix H: Table 11). Non-commercial catches included DFO charter catches of 200 fish, and recreational catches of 86,000 fish.

Table 9. Canadian commercial catches of Fraser River pink salmon by gear type, license designation and statistical area during the 2003 fishing season. *

	Purse Seine		Gillnet			Troll			
Areas	Area A	Area B	Area C	Area D	Area E	Area F	Area G	Area H	Total
1-10	0		0			0			0
11-16		705,300		16,200	0		0	75,600	797,100
121-127		0		0			600		600
20		4,400			0		0		4,400
17, 18, 29		0			18,100			1,000	19,100
Selective	0	11,900	0	0	0	0	0	0	11,900
Total Catch	0	721,600	0	16,200	18,100	0	600	76,600	833,100
% of Catch	0.0%	86.6%	0.0%	1.9%	2.2%	0.0%	0.1%	9.2%	100.0%

* Catch data from DFO ticket sales slips.

ii. United States

Catches of Fraser River pink salmon in the United States totalled 811,000 fish in 2003. All of the harvest occurred in Panel Areas, including 772,000 fish in commercial and 39,000 fish in non-commercial fisheries (Table 8). Treaty Indian fishers harvested 320,000 fish, including a catch of 38,000 in Areas 4B, 5 and 6C, and 283,000 fish in Areas 6, 7 and 7A (Table 10). Non-Indian catches totalled 452,000 pink salmon, including 398,000 fish by purse seines, 8,400 fish by gillnets and 45,000 fish by reefnets. Weekly catches of Fraser River pink salmon in United States Panel Areas are shown in Appendix H (Table 12).

Table 10. United States commercial catches of Fraser River pink salmon by user group, gear type and statistical area during the 2003 fishing season. *

Areas	Troll	Purse Seine	Gillnet	Reefnet	Total
		Treaty Indian			
4B, 5 and 6C	0	0	37,600	0	37,600
6 and 7	0	228,700	4,500	0	233,200
7A	0	37,900	11,600	0	49,500
6, 7 and 7A Total	0	266,600	16,100	0	282,700
% of Catch	0.0%	94.3%	5.7%	0.0%	100.0%
Total Catch	0	266,600	53,700	0	320,300
% of Catch	0.0%	83.2%	16.8%	0.0%	100.0%
		Non-Indian			
7	0	315,100	5,400	45,200	365,700
7A	0	82,800	3,000	0	85,800
Total Catch	0	397,900	8,400	45,200	451,500
% of Catch	0.0%	88.1%	1.9%	10.0%	100.0%
		United States			
Panel Area Total	0	664,500	62,100	45,200	771,800
Non-Panel Area Total					0
Total Catch					771,800

* Washington catch data from Washington Department of Fish and Wildlife "soft system".

VI. STOCK MONITORING

The goal of the stock monitoring program is to assess run size, daily abundance, and migration timing of Fraser River sockeye and pink salmon at different points along their migration route. This information is required for the development of fishing plans that aid in meeting escapement and catch allocation objectives. Commercial catches have historically provided much of the data used in the analyses, however, limited commercial fishing in recent years has reduced the availability of this information. Test fisheries (Table 11) conducted by the Commission or by DFO (at the Commission's request) also provide important data before and after the commercial fishing season and between fishing periods. Information about upstream migration in the Fraser River is primarily obtained by the hydroacoustic (echo sounding) program at Mission, B.C., visual observations at Hells Gate and analysis of catches in Fraser River First Nations fisheries. Furthermore, the diversion rate of Fraser sockeye through Johnstone Strait is assessed weekly during the in-season period.

The upstream passage of sockeye and pink salmon in 2003 was monitored using Whonnock (Area 29-16) test fishing data from June 23 to September 22, and using the hydroacoustic program at Mission from July 10 to September 2. Between July 10 and September 2, estimates of gross escapements of sockeye and pink salmon were derived by applying species composition data collected from gillnet test fishing at Whonnock to hydroacoustic estimates collected at Mission. Prior to July 10 and after September 2, upstream passage was monitored solely using Whonnock test fishing data. In addition, the PSC and DFO jointly conducted the eighth year of an experimental split-beam hydroacoustic program.

Table 11. Test fishing operations that were approved by the Fraser River Panel for the 2003 fishing season.

Area	Gear	Dates	Operated by
Canadian Panel Areas			
20	Purse Seine	July 24 - September 3	PSC
20	Gillnet	June 24 - August 17	PSC
29-13	Gillnet	July 10 - September 11	PSC
29-16	Gillnet	June 23 - September 22	PSC
29-1 to 6	Troll	August 11 - September 9	PSC
Canadian non-Panel Areas			
12	Gillnet	July 7 - August 14	DFO
12	Purse Seine	July 22 - September 22	DFO
13	Purse Seine	July 22 - September 9	DFO
United States Panel Areas			
7	Reefnet	July 21 - July 29	PSC

Daily observations at Hells Gate between July 2 and August 25 provided qualitative information on the success of upstream fish passage and abundance. The observations also provided a rough index for projecting the relative abundance of sockeye migrating through Hells Gate.

A. Sockeye Salmon

Run-size estimation of Fraser River sockeye is primarily based on catch, effort, escapement, racial composition and diversion rate data. These data are analysed using purse seine catch, catch-per-unit-effort (CPUE), cumulative-normal, cumulative-passage-to-date and Bayesian models,

which are described in the Pacific Salmon Commission's Technical Report No. 6[1] and in the Fraser River Panel's 1995 Annual Report[2]. Much of the data used in these models are obtained from commercial fisheries, however, in 2003 commercial fishing was very restricted. Therefore, test fishing catch and CPUE data were used extensively in assessing Fraser sockeye abundance.

Early Stuart sockeye are the first Fraser River sockeye run to arrive in the coastal waters off British Columbia. Early Stuart sockeye were forecast to return in low abundance in 2003, and were tracking considerably below both the 50% and 75% forecast levels early in the season. The Panel adopted an interim run-size estimate of 57,000 fish (75% probability level forecast). Lower than expected numbers of Early Stuart sockeye catches in the Area 20 gillnet test fishery in late June indicated that the run was either smaller than the 50% p level forecast (89,000 fish) or later than the forecast return timing of July 6 in Area 20. Analyses on July 2 and again on July 5 indicated that the migration was tracking considerably below both the 50% and 75% pre-season forecast levels. On July 8, run-size estimates ranged between 22,000 and 43,000 fish. A provisional revision of the Early Stuart run-size estimate of 25,000 fish was adopted, with a July 3 50% arrival date in Area 20.

Between July 14 and July 18, estimates ranged between 24,000 and 35,000 fish. The abundance of Fraser River sockeye in both marine assessment areas and in the Fraser River remained low and by July 25, analyses of sockeye sampled from the Area 20 gillnet test fishery indicated that the marine migration of Early Stuart sockeye was complete. Based on these assessments, the in-season run-size estimate of Early Stuart sockeye was increased from 25,000 fish to 30,000 fish, with 50% migration timing through Area 20 of July 4 (one day later than average). Final in-season estimates of Early Stuart abundance and gross escapement were 30,000 and 29,000 fish, respectively. This low return was likely due in part to stress experienced by the brood-year (1999) spawners, because of high Fraser River flow conditions during their freshwater migration.

Later in July and early in August, management efforts focused on Early Summer-run sockeye. Assessments were based on an examination of the early-timed component of Early Summer-run sockeye, independent of the Scotch/Seymour group. The pre-season forecast of the Early Summer-run group was 412,000 fish with the later-timed Scotch/Seymour component comprising 19%. Early assessments indicated that the return of Early Summer-run sockeye was either later-timed than normal and/or at lower abundance levels than were forecast. On July 22, the early-timed component (not including the Seymour-Scotch stock complex) was tracking between the 50% and 75% probability level forecasts of abundance with an expected timing of six days later than normal. By late July, estimates for the aggregate run size ranged between 267,000 and 560,000 fish, depending on assumed timing.

By the end of July, the early-timed component of the run appeared to be building, while the later-timed Seymour-Scotch group continued to track close to the 50% probability level forecast. On August 1, the Panel approved an in-season provisional estimate of the aggregate (i.e., both early and later-timed components) run size of Early Summer-run sockeye of 550,000 fish (comprised of 400,000 early-timed Early Summer fish and 150,000 Seymour/Scotch sockeye), which was approximately 33% higher than the 50% probability level forecast. The assessment of the 50% migration timing of the early-timed component through Area 20 was July 27 (six days later than normal). By mid-August, estimates ranged between 375,000 and 580,000 fish. The Panel-approved provisional run-size estimate of 550,000 fish for Early Summer-run sockeye remained unchanged despite continued strength in the Seymour/Scotch group. On August 19, the run-size estimate for Early Summer-run sockeye was increased from 550,000 to 585,000 fish, while the escapement past Mission was nearing completion at 382,000 fish (83% of the gross escapement goal). Final in-season estimates of Early Summer-run abundance and gross escapement were 590,000 fish and 384,000 fish (Table 13) (85% of the gross escapement goal), respectively. The Seymour/Scotch component comprised 29% and 25% of the final in-season

[1] Pacific Salmon Commission. 1995. Pacific Salmon Commission run-size estimation procedures: An analysis of the 1994 shortfall in escapement of Late-run Fraser River sockeye salmon. Pacific Salmon Comm. Tech. Rep. No. 6: 179 p.

[2] Pacific Salmon Commission. 1998. Report of the Fraser River Panel to the Pacific Salmon Commission on the 1995 Fraser River sockeye and pink salmon fishing season. Vancouver, B.C., 64 p.

estimates of Early Summer-run abundance and gross escapement, respectively. The 50% migration timing of Early Summer-run sockeye through Area 20 was estimated to have occurred on July 30, approximately five days later than average.

Similar to recent years, the assessment of Summer-run sockeye abundance in 2003 was based primarily on projections of abundance through the test fisheries and on the reconstruction of catches and escapements past Mission (cumulative-normal, cumulative-passage and Bayesian models) rather than on commercial catch and effort models. Summer-run sockeye stocks comprised the largest proportion of the Fraser sockeye return with a forecast total of 3,360,000 fish. The timing of Chilko migration through Area 20 was forecast to be August 13 (six days later than the long-term average). Early in August, Summer-run sockeye were tracking four to five days earlier than the forecast timing and abundance. On August 11, model estimates ranged between 2,300,000 and 5,300,000 sockeye, depending on the assumed timing, and the Panel adopted the pre-season forecast of 3,360,000 fish as an in-season run-size estimate. Analyses in mid-August suggested that the 50% arrival timing of Summer-run sockeye through Area 20 would be August 8. By early September it was estimated that the 50% migration timing of these sockeye occurred on August 7 (average timing). Estimates in late August/early September ranged between 3,100,000 and 3,300,000 fish and on August 19, the run-size estimate was lowered to 3,300,000 fish (slightly lower than the 50% probability level forecast). This Panel-approved estimate remained unchanged through mid-September. By the end of the season, Summer-run sockeye abundance was estimated at 3,229,000 fish with a gross escapement of 2,226,000 fish (Table 13) (135% of the gross escapement goal).

Preliminary assessments of True Late-run sockeye abundance in mid-August indicated that the run was tracking a return consistent with the 50% probability level forecast (1,319,000 fish). Birkenhead sockeye were forecast to return at an abundance level of 322,000 fish. In-season assessments indicated that a low proportion of True Late-run sockeye were delaying in marine terminal areas. Estimates of Late-run abundance on August 26 ranged between 1,200,000 and 1,360,000 fish. By early September, estimates ranged between 1,300,000 and 1,340,000 fish; the Panel approved the forecast return for True Late-run sockeye (1,319,000 fish, excluding Birkenhead sockeye) as a provisional, in-season run-size estimate. On August 29, the Panel approved the forecast of 322,000 Birkenhead sockeye as a provisional in-season run-size estimate.

Estimation of the timing of True Late-run sockeye was an important component of the management of this run-timing group. Assessments were based on the relationship between timing and the proportion of Late-run sockeye that had reached the Strait of Georgia and then migrated upstream. By mid August, it was evident that the upstream timing of Late-run sockeye would be earlier than normal, with 50% passage through the lower river in late August. In addition, the Area 29 troll test fishery indicated that less than 30% of Late-run sockeye were estimated to be delaying in the lower Strait of Georgia. The 50% migration date of True Late-run sockeye past Mission was estimated to be August 27, which is two to three weeks earlier than their timing prior to 1996. Due to this extremely early river-entry timing, it was estimated that over 80% of the True Late-run sockeye migrating into the Fraser River would die prior to successfully spawning.

By early September, abundance indicators suggested that the run size of Birkenhead sockeye would likely exceed the present provisional estimate of 322,000 fish, while the provisional run-size estimate for True Late-run Fraser sockeye (1,319,000 fish) was maintained by the Panel. On September 26, the Panel adopted a run-size estimate of 1,200,000 True Late-run sockeye (excluding Birkenhead). By the end of the season, True Late-run sockeye abundance was estimated at 1,183,000 fish, with a gross escapement of 908,000 fish (Table 13) (81% of the gross escapement goal). The final in-season estimate of Birkenhead sockeye abundance was 376,000 fish, with a gross escapement of 260,000 fish (Table 13) (171% of the gross escapement goal). The 50% migration timing of Late-run sockeye past Area 20 was projected to have occurred on August 15 (average timing).

Cottonwood test fishing CPUEs are plotted against the daily hydroacoustic estimates of sockeye passage at Mission in Figure 6. The pattern of daily migration in the river as indexed by Cottonwood test fishing CPUE data and by estimates of escapement from the Mission hydroacoustic program and the Whonnock test fishing program were similar. Daily migration estimates were obtained using hydroacoustic methods until September 2, after which Whonnock

test fishing CPUE models were used. The Cottonwood data are lagged one or two days, which is the estimated travel time for sockeye between the Cottonwood and Mission sites.

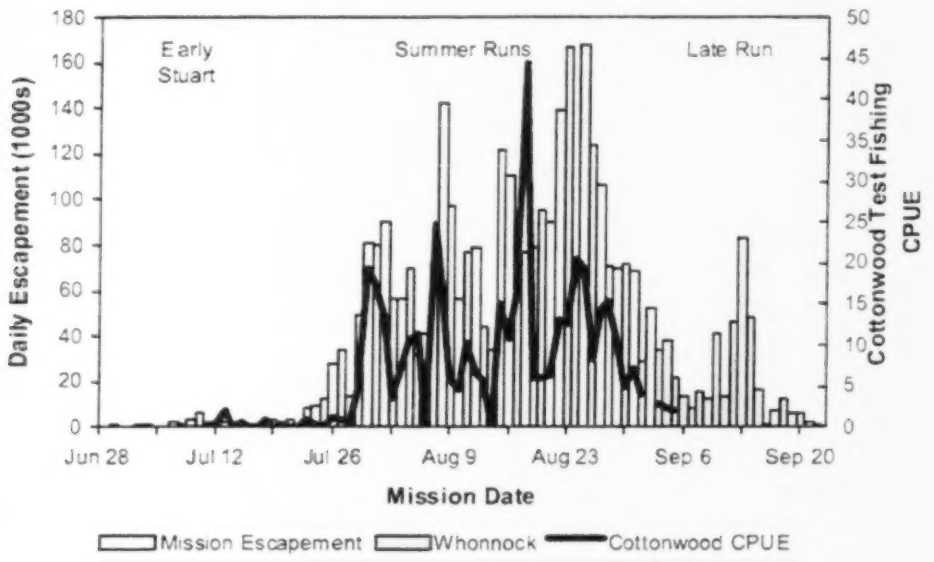

Figure 6. Daily Mission escapements of sockeye salmon estimated by Mission echosounding (July 10 to Sept. 2) and Whonnock test fishing CPUE (before July 10 and after Sept. 2), compared with test fishing CPUEs at Cottonwood one to two days earlier.

By late July, migration conditions for sockeye in the Fraser River had degraded considerably. Rapidly declining discharge levels and increasing water temperatures (approaching 19°C) likely imparted physiological stress and slowed the migration of sockeye. Substantial en route mortality of sockeye migrating to their spawning grounds may occur under these unfavourable conditions. By early August, the discharge at Hope had decreased further and temperatures reached 20°C. Water temperatures generally exceeded 19°C until August 22 and by August 24 they were less than 18°C. Throughout the summer, discharge levels at Hope were typically 25% or more below average. These factors likely had a negative impact on the in-river migration success of Fraser sockeye from all run-timing groups. By the end of August, water temperature conditions were generally more favourable for the migration of sockeye, however, low water levels and high water temperatures in some Fraser River tributaries continued to create adverse conditions for some sockeye.

Early in the 2003 sockeye migration, the pre-season diversion rate forecast was 60%, however, the number of Fraser sockeye migrating through Johnstone Strait remained low throughout July. The in-season estimate of the diversion rate of Fraser River sockeye migrating through Johnstone Strait increased from about 20% in late July to between 60% and 70% in early August. The diversion rate estimate decreased to approximately 50% in mid August. By the end of August, however, the diversion rate estimate had increased and remained at or near 70% for the balance of the season. The final estimate of the proportion of sockeye diverting through Johnstone Strait was 74%.

B. Pink Salmon

Assessments of Fraser River pink salmon in marine areas in 2003 were based primarily on data from purse seine test fisheries due to the shortage of commercial data. Escapements to the Strait of Georgia were estimated by expansion of CPUE data from the purse seine test fisheries. The proportion of Fraser River pink salmon in these catches was initially estimated using pre-season projections of racial composition. These estimates were later replaced in-season by genetic stock identification (GSI) estimates.

Fraser River pink salmon were forecast to return at an abundance of 17,273,000 fish (50% probability level forecast) in 2003. Peak migration timing of Fraser River pink salmon through Area 20 typically occurs between the end of August and early September. Assessments of the 50% arrival timing of Fraser pinks in Area 20 were variable, however, they suggested timing earlier than August 31. By mid-August, observations of pink salmon at Hells Gate suggested that the run was much earlier than average. Large catches of pink salmon in test fisheries suggested the potential for a significant increase in the pre-season run-size estimate.

Very large catches of pink salmon continued to occur in Johnstone Strait and Juan de Fuca Strait purse seine test fisheries into late August. By the end of August, analyses of the passage of Fraser River pink salmon through the marine assessment areas accounted for over 15,000,000 fish and a much higher estimate of gross escapement into the Fraser River (491,000 fish) than normal for this date. Assessments were preliminary at this stage because the 50% arrival timing of Fraser pinks through Area 20 was not forecast to occur until August 31.

On September 5, the Panel approved a provisional run-size estimate of 25,000,000 Fraser River pink salmon. By September 19, assessments were accounting for 26,000,000 pinks through the marine assessment areas. On September 26, the Panel approved a final in-season run-size estimate of 26,000,000 Fraser River pink salmon, with an Area 20, 50% arrival timing of August 25. This was the largest estimated Fraser River pink run since at least 1959. This exceptionally large run was primarily attributable to the large number of fry produced in the brood year (2001), in conjunction with favourable marine survival conditions during their ocean residence. Fisheries and Oceans Canada did not conduct a mark-recapture program in 2003. A spawning ground estimate of total Fraser River pink escapement is therefore not available. The escapement estimate calculated by subtracting total catch from total run size is 23,931,000 fish.

The pre-season forecast of the diversion rate of Fraser River pink salmon through Johnstone Strait was 70%. During late August, very large catches of pink salmon were occurring in the Johnstone Strait and Juan de Fuca Strait purse seine test fisheries, with peak catches occurring between August 18 and 21. Test fishing catches in Johnstone Strait, although variable, indicated a strong pink salmon migration through this approach area. By early-mid September, the estimated diversion rate of pink salmon remained at 70%. The seasonal estimate of the diversion rate of Fraser River pink salmon was 48%. The estimated 50% migration date (Area 20 timing) was August 25, which was approximately six days earlier than average.

The pattern of daily pink salmon escapements in the Fraser River could not be reliably determined due to the absence of CPUE data from DFO's Duncan Bar program that was conducted in previous years. In addition, the Mission hydroacoustic program was terminated after September 7, due to budget concerns. Timing estimates for the in-river migration of pink salmon were therefore based on Whonnock test fishing CPUE data. These data generate a highly uncertain Mission 50% date of September 9. Because the daily migration of pink salmon was still fairly strong when test fisheries terminated, this timing estimate may be biased towards an earlier date, but the extent of the bias is impossible to assess with the available information.

C. Split-Beam Hydroacoustic Study at Mission

The focus of the 2003 Mission Split-Beam Hydroacoustics program was to test the ability of the program to provide in-season management information on a daily basis. The system also provided additional information on fish behaviour during important periods of the season. The cross-section of the river was sampled using a combination of acoustic systems similar to that used in 2002, i.e., a south shore-based side-looking system to sample fish off the south shore and a vessel-based, mobile downward-looking system to sample fish in the middle and the north bank of the river. An effort was made to extend the fish-deflection weir from the south shore to it's maximum allowable lengths according to river-height changes throughout the season. This was done to maximize insonification of migrating fish by the shore-based side-looking split-beam system. The weir prevented fish from swimming behind the side-looking transducers, and forced them to migrate beyond the near-field ranges of the sound-beam. This facilitated obtaining

adequate numbers of echoes for tracking individual fish, particularly pink salmon, which typically migrate close to shore. The aims and the maximum sound ranges (at these aims) of the side-looking transducers were also optimized to minimize the non-sampled areas where migratory abundance had to be estimated by extrapolation. To reduce the positioning-bias effect of the mobile downward looking system, a narrower beam transducer of 15 degrees was chosen for collecting echo data with the mobile system.

The general performance of the 2003 split-beam system and findings from the preliminary analyses are summarized as follows:

1. The system is capable of producing timely, daily estimates of migratory abundance of Early Summer-run and Summer run stocks at density levels observed at Mission in 2003.
2. The system was capable of providing assessments of surface-oriented fish on August 5, when a large number of migratory fish appeared two to three metres below the surface.
3. The system detected higher proportions of daily downstream movements in the month of August than observed in 2002. The weighted-average ratio of downstream migrants in 2003 was 18% versus 12% in 2002 for the period from July 13 to September 7. The acoustically observed downstream migrant estimates were consistent with the downstream movements of LGL's radio-tagged fish observed at Mission.
4. The system detected a shift in fish distributions from the south shore toward the middle of the river and north shore relative to the fish distributions observed in 2002.
5. The system estimated a total of 4,300,000 salmon from July 11 to September 7, compared to 5,400,000 salmon estimated by the single-beam system for the same time period.
6. The system was not saturated by pink salmon targets up to the program termination date of September 8, 2003. Tracking of individual pink salmon was satisfactory for density levels observed up to September 8 at Mission.

VII. RACIAL IDENTIFICATION

PSC staff conduct programs designed to identify the stock proportions of Fraser River sockeye and pink salmon in commercial, test and First Nations catches. These data provide information on the abundance and timing of sockeye and pink salmon as they migrate to their natal rivers in the Fraser River watershed. Racial data are also used to account for Fraser River sockeye salmon wherever they may be caught, and to apportion the daily estimates of sockeye escapement past Mission into discrete stock groups.

Racial analysis methods for pink salmon in 2003 were similar to past years. Racial analysis methods for sockeye salmon in 2003 were like those of 2002, with scales for scale pattern analysis and tissue samples for DNA analysis collected regularly from marine, river, and test fisheries. Both scale and DNA data were analysed to generate racial composition estimates, however, because of overlap in scale characteristics, DNA analyses were primarily used for management decisions. In 2003, parasite analyses were not used for stock identification purposes.

A. Sockeye Salmon

Analyses of scale samples from catches in commercial and test fisheries were conducted daily, beginning in late June and continuing through mid-September. Commission staff sampled test fishing catches and commercial sockeye landings at sites in Vancouver, Steveston, Nanaimo and Campbell River in British Columbia, and at Bellingham and Blaine in Washington State. The Alaska Department of Fish and Game (ADF&G) collected samples for the PSC from the District 104 purse seine fishery at landing sites in Petersburg and Ketchikan, Alaska. DFO provided samples to the PSC from Johnstone Strait purse seine test fisheries. In addition, the PSC requested that DFO and First Nations personnel coordinate weekly scale sampling of Fraser River First Nations fisheries from six regions along the Fraser River between Chilliwack and Prince George.

Tissue samples for DNA analysis were collected and analysed from nearly 7,400 sockeye from test and commercial fisheries in United States Areas 7, 7A, and in Canadian Areas 12, 13, 20 and 29, with approximately two-thirds of the samples collected in August. The collection of

opercular tissue punches, scales and other data from the same fish (i.e., matched samples) provided stock-specific age composition and size information from mixed-stock catches of sockeye.

i. Analyses

In 2003, the most abundant stocks were Pitt, Early Shuswap, Chilko, Quesnel, Late Stuart, Stellako, Birkenhead, Late Shuswap and Weaver. These stocks, along with less abundant stocks, were combined to define ten stock groups on the basis of identifiability and run timing: Early Stuart, Fennell/Bowron/Raft, Nadina/Gates/Pitt, Scotch/Seymour, Chilko, Quesnel, Late Stuart/Stellako, Birkenhead, Adams/Lower Shuswap/Portage, and Weaver/Harrison/Cultus (Table 12). Both scale-based and DNA-based analyses included model adjustments on the basis of assumptions about the migratory timing of sockeye stocks. Application of models to scale data used *a priori* adjustment, i.e., inclusion of stock groups in models was based on their likelihood of presence (e.g., samples collected from Area 20 in July were not examined with models that included Birkenhead sockeye scale standards). Adjustments of DNA-based allocations were made *a posteriori* by examination of unadjusted results and consideration of predicted misallocation rates among stock groups (e.g., allocations to Early Stuart sockeye populations in samples collected from marine areas in August were interpreted as misclassification of Late Stuart sockeye).

Table 12. Individual stocks comprising the stock groups used in 2003.

Stock Group	Component Stocks
	Early Stuart
Early Stuart	Early Stuart stocks
	Early Summer
Early Miscellaneous	Fennell, Bowron, Raft, Chilliwack, Nahatlatch, Taseko
Nadina/Gates/Pitt	Nadina, Gates, Pitt
Seymour/Scotch	Scotch, Seymour, early Eagle, Cayenne, Upper Adams
	Summer
Chilko	Chilko, south end Chilko Lake
Quesnel	Horsefly, McKinley, Mitchell, Roaring, Wasko, Blue Lead
Late Stuart/Stellako	Stellako, Tachie, Middle River, Pinchi, Kuzkwa
	Late
Birkenhead	Birkenhead, Big Silver, Douglas
Late Shuswap/Portage	Lower Adams, Portage, Lower Shuswap, Middle Shuswap, Little Shuswap, Shuswap Lake, late Eagle
Weaver/Misc. Lates	Weaver, Harrison, Cultus, Widgeon

Stock-specific baseline standards for in-season scale analyses were developed from two sources. The preferred source were scales from previous year age 3 and age 4 siblings of current year age 4 and age 5 sockeye, respectively, because they reared together in the same nursery lake environment and thus had similar freshwater scale patterns. A second, less preferred source was used when sibling data from the previous year were unavailable. In this second method, baseline standards were developed using data from the same age class but from prior years. Because of the low return of age 3 fish in 2002 to all Fraser River sockeye spawning grounds (with the exception of Gates Creek and Chilko River) the majority of scales used in the construction of standards for in-season models came from other years' age 4 returns. Relative to the use of jack samples, reliance on past years' age 4 scales to generate standards for returning 4-year olds increases uncertainty in in-season analyses. Age 5 sockeye were examined in-season using standards developed from siblings via spawning ground samples of age 4 sockeye collected in 2002.

Stock discrimination is normally most challenging during the transition period from mostly Early Summer-run stocks to high proportions of Summer-run stocks, and during the transition from mostly Summer-run stocks to mostly Late-run stocks. The problem was exacerbated in 2003, as it has been in other recent years, by increased overlap in migration timing between Summer-run and Late-run sockeye. Early Summer, Summer, and Late-run sockeye were estimated to be present in Whonnock test fishery catches during most of August.

Catches of Fraser River sockeye in District 104 purse seine fisheries are usually estimated using discriminant function analysis for age 4_2 sockeye based on length data and data from four scale variables. Fish length is an informative variable for distinguishing age 4_2 Fraser sockeye from other age 4_2 sockeye. Few lengths were sampled from District 104 catches in 2003 and, therefore, the PSC's ability to assess Fraser catches was compromised. Estimates of age 4_2 Fraser sockeye proportions provided by the Alaska Department of Fish and Game were adopted for 2003 as they are based on models that use scale variables and have produced estimates comparable to PSC estimates in previous years. Similar to previous years, the age composition of Fraser sockeye caught in Areas 12 and 20 was applied to expand the estimated catch of age 4_2 Fraser River sockeye in District 104 to an estimate for all ages of Fraser River sockeye caught in that fishery. District 104 purse seine catches in 2003 included 330,000 sockeye, of which 80,000 fish were age 4_2 sockeye. More than half of these (45,000 fish) were estimated to be Fraser River age 4_2 sockeye, and Fraser sockeye contributed less to catches of other age groups. Approximately 68,000 sockeye caught in District 104 were estimated to be of Fraser River origin.

ii. Microsatellite DNA Program Update

Baselines for DNA analysis in 2003 were similar to those used in 2002. Analyses of 2002 data and simulation analyses indicated that sample sizes of 96 individuals were usually sufficient to provide reliable DNA estimates of stock proportions in mixture samples. Uncertainty regarding funding and the ability to collect complete samples of sockeye were of concern to the DNA program in 2003.

Table 13. Comparison of hydroacoustic-based gross escapement estimates for Fraser River sockeye salmon stocks in 2003, using in-season versus post-season stock composition estimates.

Run	Gross Escapement [1]		Difference	
	In-season [2]	Post-season [3]	Fish	%
Early Stuart	29,400	29,600	200	1%
Early Summer				
Early Miscellaneous	121,500	150,000	28,500	23%
Nadina/Gates/Pitt	164,600	114,800 [4]	(49,800)	(30%)
Seymour/Scotch	97,900	74,400	(23,500)	(24%)
Total	384,000	339,200	(44,800)	(12%)
Summer				
Chilko	1,147,900	992,300	(155,600)	(14%)
Quesnel	714,700	537,600	(177,100)	(25%)
Late Stuart/Stellako	363,000	240,000	(123,000)	(34%)
Total	2,225,600	1,769,900	(455,700)	(20%)
Late				
Birkenhead	260,300	307,900	47,600	18%
Late Shuswap/Portage	556,500	464,100	(92,400)	(17%)
Weaver/Misc. Lates	351,700	262,500	(89,200)	(25%)
Total	1,168,500	1,034,500	(134,000)	(11%)
Total	3,807,500	3,173,200	(634,300)	(17%)

1 Escapement past Mission plus Aboriginal catches below Mission.
2 Mission escapement derived from daily single-beam hydroacoustic estimates.
3 Mission escapement derived from daily split-beam hydroacoustic estimates.
4 Includes actual upper Pitt River spawning escapement estimate.

iii. Estimates of Escapement and Production by Stock

Post-season estimates of racial proportions based on scales often differ from estimates made in-season. These differences are partially due to differences between pre-season scale pattern standards and standards developed from scales collected on the spawning grounds. The accuracy of pre-season scale standards has been limited, especially in recent years because of the lack of available data from jacks. Allelic frequencies used in genetic analyses vary little among years which typically results in smaller differences between in-season and post-season estimates of gross escapement. The largest change in estimates of gross escapement for a run-timing group in 2003 was 20% for the Summer run (Table 13), which was much larger than in 2002. The estimated gross escapement of most stock groups into the Fraser River was 14% to 34% lower after post-season analyses were conducted.

The discrepancy during the first part of the run was likely due to a change in hydroacoustic assessment of fish passage at Mission. Changes due to re-evaluation of stock identification data were relatively minor. For Late-run sockeye, however, more Birkenhead sockeye were counted at the spawning grounds than were estimated into the Fraser River, and stock identification analyses were likely one of the sources of bias. Both the scale-based age composition and the DNA-based stock identification suggested that a catch bias may have occurred in the Whonnock test fishery, which likely resulted in under-sampling of Birkenhead sockeye. The post-season estimate incorporated results from the Cottonwood test fishery that demonstrated higher proportions of Birkenhead sockeye and lower proportions of Late Stuart and Weaver sockeye. Inaccuracy of the sockeye-to-total-salmon ratio estimated in the Whonnock test fishery as applied to hydroacoustic estimates of passage at Mission could also have contributed to differences between observations on the spawning grounds and estimates from stock identification analyses.

The total return of Early Stuart sockeye (30,000; Table 14) was 34% of the pre-season forecast. Recorded catches for this run included 1,200 fish in test fisheries, marine fisheries and Fraser River First Nations fisheries combined. The exploitation rate for all catch areas was 4%. In addition, there was a 16,000 fish difference between Mission-based estimates of Early Stuart gross escapement and spawning ground-based estimates, at least partly related to adverse in-river migration conditions. Mission-based gross escapement estimates are the sum of Mission escapements and First Nations and recreational catches below Mission, while spawning ground-based estimates are the sum of spawning ground escapements plus all in-river First Nations and recreational catches.

The estimated return of adult Early Summer-run stocks was 549,000 sockeye (Table 14) which was about 33% greater than the pre-season forecast of 412,000. Pitt and Seymour river stocks were the largest contributors to this return. North Thompson River sockeye stocks, including those from the mainstem of the river and Raft and Fennell stocks made a substantial contribution to the return of Early Summer-run sockeye in 2003. Catch estimates for Early Summer-run sockeye included 210,000 fish in commercial, test and miscellaneous fisheries, and 68,000 fish in Fraser River recreational and First Nations fisheries. The estimated exploitation rate on Early Summer-run stocks was 51%, with a higher exploitation rate estimated for the Scotch/Seymour component than for the earlier-timed component stocks. Early Summer-run sockeye encountered warm water conditions, which likely caused some en route mortality and contributed to the 78,000 fish difference between Mission and spawning ground-based estimates of gross escapement.

The estimated run size of adult Summer-run sockeye was 2,820,000 sockeye (Table 14) (84% of the pre-season forecast). The run sizes by stock group were: Chilko - 1,559,000 fish; Quesnel - 854,000 fish; and Late Stuart/Stellako - 408,000 fish. Commercial, test and miscellaneous fishery catches totalled 1,051,000 sockeye, while Fraser River sport and First Nations fisheries caught 493,000 sockeye. The overall exploitation rate for all fishing areas was 55%. Mission-based estimates of Summer-run gross escapement exceeded up-river estimates (catch + spawning escapement) by 275,000 sockeye. Environmental conditions during migration included low water levels and high water temperatures.

The estimated return of 1,489,000 Late-run adult sockeye (Table 14) was 91% of the pre-season forecast of 1,641,000 fish. The Late Shuswap/Portage group was the largest component of the run but was weaker than forecast, while returns of Weaver/Cultus/Harrison and Birkenhead groups were both above the pre-season forecast. Commercial, test and miscellaneous catches of Late-run stocks totalled 415,000 sockeye and an additional 109,000 sockeye were caught in Fraser River recreational and First Nations fisheries. The estimated exploitation rate for Late-run sockeye (including 10,000 fish in ESSR fisheries at Weaver Creek) was 35%, while the estimate for the True Late-run component was 37%, with the Late Shuswap/Portage group having the largest stock-specific exploitation rate. The difference between lower-river and up-river estimates of gross escapement (195,000 fish for True Late-run sockeye) was most pronounced in the Weaver/Cultus and Harrison stock groups.

The total return of adult Fraser River sockeye in 2003 was estimated to be 4,889,000 adult sockeye (Table 14), 34% greater than in 1999. Catches in all fisheries totalled 2,347,000 or 48% of the run, potentially leaving 52% available for spawning escapement requirements.

Table 14. Catches, escapements, differences between estimates, run sizes and exploitation rates for Fraser River sockeye (by stock group) and pink salmon in 2003.

		Gross Escapement						Adult Exploitation Rate	
Stock Group	River & Ocean Catch *	In-river FN, Recreational, & ESSR Catch **	Spawning Escapement	Difference*** Between Estimates	Run Size Adult	Jacks	Portion of Run	River & Ocean	All Areas
Sockeye Salmon									
Early Stuart	700	500	13,200	15,900	30,300	0	1%	2%	4%
Early Summer-run									
Early Miscellaneous	47,700	36,400	60,400	53,200	197,700	400	4%	24%	43%
Nadina/Gates/Pitt	88,800	10,900	91,200	12,700	203,600	600	4%	44%	49%
Seymour/Scotch	73,500	20,500	41,800	12,100	147,900	100	3%	50%	64%
Total	210,000	67,800	193,500	77,900	549,200	1,200	11%	38%	51%
Summer-run									
Chilko	566,200	283,900	608,300	100,100	1,558,500	3,900	32%	36%	55%
Quesnel	316,500	126,400	279,200	132,000	854,100	0	17%	37%	52%
Late Stuart/Stellako	167,900	82,600	114,900	42,500	407,900	1,800	8%	41%	61%
Total	1,050,600	492,900	1,002,400	274,500	2,820,400	5,700	58%	37%	55%
Late-run									
Birkenhead	123,400	23,700	324,100	0	471,200	800	10%	26%	31%
Late Shuswap/Portage	218,900	58,900	386,200	19,000	683,000	100	14%	32%	41%
Weaver/Cultus	55,700	17,000 1	51,700 2	127,100	251,500	400	5%	22%	29%
Harrison/Widgeon	17,200	9,800	8,400	48,500	83,900	400	2%	21%	32%
Total	415,200	109,400	770,300	194,500	1,489,400	1,700	30%	28%	35%
Total Adults	1,676,500	670,500	1,979,400	563,000	4,889,400	8,600	100%	34%	48%
Total Jacks	0	0	8,600	0	8,600				
Total	1,676,500	670,500	1,988,000	563,000	4,898,000	0			
Portion of Total Run	34%	14%	41%	11%	100%				
Pink Salmon									
Total	1,763,500	305,500	23,931,000	-	26,000,000			7%	8%
Portion of Total Run	7%	1%	92%	-	100%				

* Includes catches in all fisheries, excluding Fraser River First Nations, recreational and ESSR fisheries.

** FN = First Nations; ESSR = Excess Salmon to Spawning Requirements.

*** Differences between gross escapement estimates are the lower river estimates (Mission + IF catch, PSC) minus the up-river estimates (spawning escapement + IF catch + sport catch + ESSR catch, DFO).

1 In-river catch of Weaver sockeye includes ESSR catch of 9,985 sockeye.

2 Spawning escapement of Cultus sockeye includes 245 individuals captured as broodstock.

B. Pink Salmon

Catches of Fraser River pink salmon harvested in mixed stock fisheries have been estimated using GSI (genetic stock identification) techniques since 1987. The GSI program relies on genetic differences among stocks of pink salmon, expressed as different enzyme phenotypes in their body tissues. Pink salmon that spawn in Washington and British Columbia have been sampled and their tissues (muscle, heart, liver, and eye) electrophoretically analyzed. These genetic data have been compiled into baselines that profile the genetic characteristics of pink salmon stocks. During the in-season management period, muscle tissue samples from 90 to 135 pink salmon were collected weekly from fisheries of interest. After electrophoretic screening of the tissue samples, the results were analyzed using a maximum likelihood (MLE) model. The model compares known genetic standards (from baseline samples) to genetic data from samples of unknown stock composition (from in-season, mixed-stock fishery samples) and generates estimates of the most likely stock composition.

In 2003, as in 2001 and 1999, there were few large-scale commercial fisheries directed at Fraser River pink salmon. Consequently, only a small number of samples were required for GSI. The primary uses of GSI estimates of pink salmon stock contributions in 2003 were catch allocation, migration analyses and run-size estimation. GSI samples were collected in Canadian statistical Areas 12, 13 and 20, and United States Areas 7 and 7A from early August to early September.

The contribution of Fraser pinks in the GSI samples collected from Areas 12 and 13 purse seine catches increased from approximately 35% in early August to 85% by the end of August. GSI samples collected from Area 20 purse seines in late August indicated that Fraser pinks contributed 95% of the pink salmon in these catches. In United States Area 7, Fraser pinks comprised an estimated 73% of the catch in mid-August. By August 19, the contribution of Fraser pinks in United States Area 7A had increased to 93%. The pattern of high Fraser pink contributions relative to other co-migrating stocks (Puget Sound and Canadian non-Fraser) in sampled fisheries, was generally consistent with indications from GSI analyses in prior years.

Catches of Fraser River pink salmon in 2003 totalled 2,069,000 fish in all fisheries (Table 14). This catch represents a very low exploitation rate of 8%, which is about one-eighth of the average rate since 1981.

VIII. ESCAPEMENT

The enumeration of sockeye and pink salmon spawning escapements in the Fraser River watershed (Figure 7) has been conducted annually by DFO. However, in 2003, DFO did not conduct an escapement enumeration program on Fraser River pink salmon and therefore there is no official escapement estimate. Data collected in the program for Fraser River sockeye salmon were used to generate estimates of total sockeye production on a stock and run-timing group basis. The Fraser River Panel uses the escapement estimates to determine if the spawning escapement goals have been met, which is the highest priority objective of the Panel's in-season management. Further, the escapement estimates and data collected on the spawning grounds by DFO help in the post-season evaluation of stock identification and stock monitoring programs conducted by PSC staff. These samples and data include scales, otoliths, tissues and length measurements collected by DFO for processing by PSC staff.

A. Sockeye Salmon

As in recent years, during the 2003 pre-season management period, the Panel adopted a precautionary management policy for Late-run sockeye based on the presumption that True Late-run sockeye would enter the Fraser River early and a significant portion would not survive to spawn. As a result, it was anticipated that the spawning escapement target for Summer-run sockeye would be exceeded.

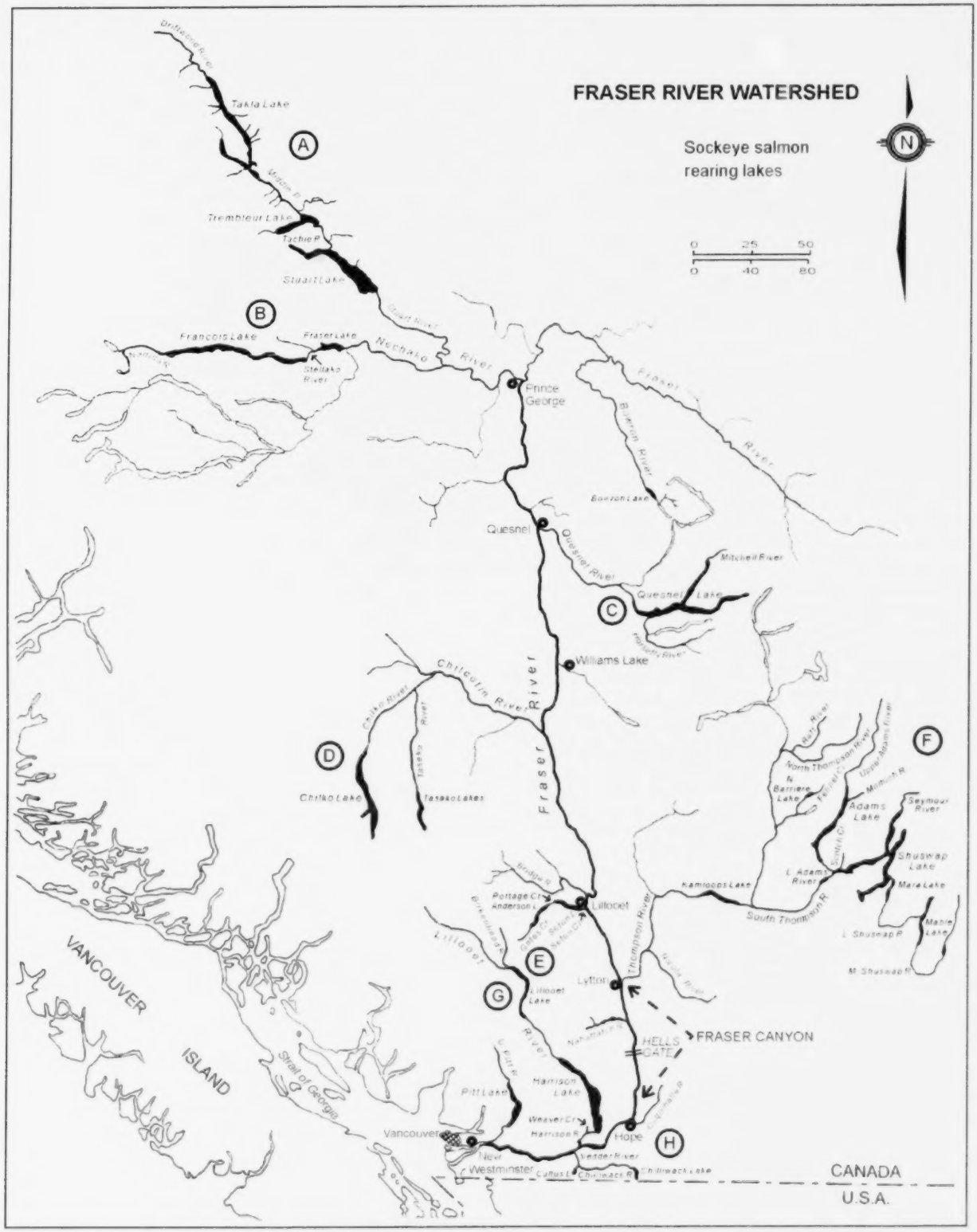

Figure 7. Sockeye salmon spawning grounds in the Fraser River watershed.

In 2003, the final estimate of adult sockeye escapement (primarily age 4 and age 5 fish) was 1,979,000 fish (Table 15, Appendix H, Table 13). The 2003 escapement was 148,000 fish (8%) larger than estimated in the brood year (1,831,000). The escapement of 8,600 jack sockeye (age 3 fish) was more than triple the brood year level (2,500 fish). The Early Stuart escapement of 13,000 adults was approximately half the brood year level of 25,000 fish. Escapements of Early Summer-run stocks increased from the brood year level of 103,000 to 194,000 fish. Summer-run escapements were 1,002,000, which was 22% lower than in 1999. Approximately 770,000 Late-run sockeye arrived at their spawning grounds in 2003, which was 82% higher than the brood year.

Table 15. Adult sockeye salmon escapements by run-timing group on the 2003 cycle for years 1987-2003.

	Spawning Escapement				
Run	1987	1991	1995	1999	2003
Early Stuart	148,000	141,000	123,000	25,000	13,000
Early Summer	200,000	271,000	161,000	103,000	194,000
Summer	659,000	1,256,000	926,000	1,282,000	1,002,000
Late	889,000	1,638,000	521,000	421,000	770,000
Birkenhead	165,000	296,000	42,000	50,000	324,000
True Lates	724,000	1,342,000	479,000	371,000	446,000
Adult Sockeye	1,896,000	3,306,000	1,731,000	1,831,000	1,979,000

The distribution of the 13,000 Early Stuart (A; Figure 7) spawners in 2003 was: 400 fish to the Driftwood system (3%); 3,100 fish to tributaries of Takla Lake (23%); 7,600 fish to Middle River tributaries (57%); and 2,100 fish to tributaries of Trembleur Lake (16%) (Appendix H, Table 13). The largest escapements in 2003 were reported in Kynock Creek (4,100 fish), Forfar Creek (2,300 fish), Gluske Creek (1,600 fish) and Felix Creek (1,300 fish). The spawning success of Early Stuart sockeye in 2003 averaged 97%, exceeding the long-term average of 90%.

The escapement of Late Stuart (A; Figure 7) sockeye in 2003 was estimated at 37,000 fish. Escapement to the Tachie River (28,000 fish) was 64% of the brood year escapement, however, it exceeded the recent cycle-year average by 18%. Spawning success was estimated at almost 100%.

Early Summer-run sockeye escapements to the Nechako system (B; Figure 7) included 3,200 fish to the Nadina River (and spawning channel) and Glacier Creek, which was 31% of the brood year escapement and approximately 10% of the recent (1983-1999) cycle-year average. Although this escapement was low, the spawning success was about 99%. The escapement of Summer-run sockeye to the Stellako River was 78,000 fish, which was 56% of the brood year escapement. The estimated spawning success of Stellako sockeye in 2003 was almost 100%.

Spawning escapements to the Bowron River were 6,800 fish in 2003, which was 17% lower than the brood year escapement. The spawning success of Bowron sockeye was 90%.

Escapement of 279,000 sockeye to the Quesnel watershed (C; Figure 7) was 47% higher than the brood year escapement and over double the 1983-2003 cycle-year average escapement (128,000 fish). Spawning in the Horsefly River system accounted for 182,000 fish, which constituted 65% of the Quesnel watershed escapement, while the escapement of 89,000 Mitchell River system spawners represented 32% of the watershed escapement. The overall spawning success of Quesnel sockeye averaged 99%, despite low water levels in the Horsefly River in 2003.

Chilko River and Lake escapements (D; Figure 7) of 608,000 Summer-run sockeye were 68% of the brood year escapement and 93% of the 1983-1999 cycle-year average. Their spawning success was estimated at almost 100%. The escapement of 380 Early Summer-run sockeye to Taseko Lake was only 11% of the recent cycle-year average, however, spawning success was estimated at 100%.

Early Summer-run escapements of 9,800 fish to Gates Creek and Channel in the Seton-Anderson system (E; Figure 7) were over double the brood year level but slightly below the recent

cycle-year average. Age 3 jack sockeye comprised approximately 6% of the Gates escapement in 2003. The success of sockeye spawning in Gates Creek and the channel averaged 83%, which exceeded the cycle-year average of 72%. The return of 5,000 Late-run sockeye to Portage Creek was 21% lower than the brood year and 40% lower than the cycle-year average. Water levels in Portage Creek during spawning were very high, which made accurate enumeration difficult. The spawning success of Portage Creek sockeye was almost 100%.

Sockeye stocks in the Thompson River watershed spawn in the North Thompson and South Thompson River systems (F; Figure 7). The total escapement of Early South Thompson stocks was 42,000 fish, which was 44% higher than in the brood year but 43% lower than the recent cycle-year average. In the South Thompson watershed, the Early Summer-run escapement of 31,000 Seymour River sockeye represented 74% of the watershed escapement and their spawning success was almost 100%. Spawners returning to Scotch Creek (5,100 fish) and Eagle River (2,000 fish) also had a spawning success of almost 100%.

Late-run sockeye escapements to the South Thompson River watershed totalled 381,000 fish, which was 12% higher than the brood year escapement but 34% lower than the recent cycle-year average. The spawning success of these sockeye averaged 96%, which equalled the recent cycle-year average. Escapement to the Adams River system was estimated at 356,000 fish, which exceeded the brood year escapement by 28%, but was 42% lower than the recent cycle-year average. Few pre-spawn Adams River sockeye carcasses were recovered in the migratory and holding areas, unlike the brood year. The spawning success of Adams River sockeye was 97%, which exceeded the brood year level of 77%. Escapement to the Little River was 16,000 sockeye, which was 16% lower than the brood year but slightly higher than the recent cycle-year average. The spawning success of Little River sockeye was 83%, which exceeds the brood year and recent-year average. The escapement of Lower Shuswap sockeye was 5,800 fish, which was slightly lower than the brood year and just over half of the recent cycle-year average.

In the North Thompson area, an estimated 45,000 Early Summer-run sockeye returned, which was almost four times higher than the brood year escapement and the largest escapement on record for this cycle. The North Thompson River (24,000 fish), Raft River (10,000 fish) and Fennell Creek (9,000 fish) contributed the largest escapements to this watershed. The spawning success of these sockeye averaged 97%, which exceeded the long-term average of 87%.

Late-run sockeye escapement to the Harrison-Lillooet area (G; Figure 7) was 382,000 fish in 2003. The 310,000 sockeye escaping to the Birkenhead River was the second largest on record for this cycle and over six times higher than the brood year escapement. The spawning success of Birkenhead sockeye was similarly high (99%). Approximately 50,000 sockeye returned to Weaver Creek and spawning channel, which was about 44% higher than the brood year and cycle-year average escapements. The spawning success of the 15,000 adult sockeye that spawned in Weaver Creek was 90% and in the spawning channel the 35,000 spawners had had a success rate of 87%. The Big Silver Creek escapement of 11,000 fish was the largest on record for this cycle and was approximately 14 times higher than the brood year escapement and 30 times higher than the cycle-year average escapement. The escapement of 8,600 sockeye to the Harrison River was close to brood and cycle-year average escapements. The spawning success of Big Silver Creek sockeye (98%) and Harrison River sockeye (100%) was high in 2003.

The escapement of Early Summer-run sockeye to Lower Fraser River tributaries (H, Figure 7) totalled 88,000 sockeye in 2003. The upper Pitt River escapement of 78,000 fish was over twice the brood year escapement and the largest on record for this stock, while the spawning success was 97%. Chilliwack Lake and Nahatlatch River spawners accounted for 3,400 and 2,500 fish, respectively in 2003. The escapement of 1,900 Late-run sockeye to Cultus Lake was the lowest on record for this cycle and far lower than the brood year escapement of 12,000 fish. However, the spawning success of the sockeye in the brood year was only 10%, while in 2003 it was 77%.

The overall spawning success of sockeye salmon in the Fraser River watershed in 2003 was 98%, while the effective female spawning population was 1,062,000 sockeye.

B. Pink Salmon

As noted earlier, DFO did not conduct a program to estimate the escapement of Fraser River pink salmon in 2003. Consequently, estimates of Fraser River pink salmon escapement in 2003 are highly uncertain. The final in-season estimate of Fraser River pink salmon run size by the PSC in 2003 was 26,000,000 fish, however, this estimate had high uncertainty associated with it. If the estimated run size of 26,000,000 Fraser pinks is accurate, the escapement was 23,931,000 fish (Table 14, estimated run size minus estimated catch), which would have been the largest escapement of Fraser pinks since at least 1959 (Figure 5, Appendix H, Table 14).

IX. ACHIEVEMENT OF OBJECTIVES

The mandate of the Fraser River Panel is to manage commercial fisheries in the Panel Area to achieve a hierarchy of annual goals. In order of importance, the goals are to: (a) achieve spawning escapement targets for Fraser River sockeye and pink salmon that are set by Canada or modified by Panel agreement; (b) achieve targets for international sharing of the TAC as defined in the Treaty or by agreement of the Parties; and (c) achieve domestic catch allocation goals within each country. In the process of achieving these objectives, the Panel must consider conservation concerns for other stocks and species of salmon when planning and conducting the fisheries. Panel management strategies are assessed after each season to determine whether the goals were achieved and to identify management techniques and data collection programs that could be improved.

On February 17, 2005, the Panel agreed on a revised Chapter 4, Annex IV of the Pacific Salmon Treaty. The revised Annex established new methods for making management decisions, and for calculating the TAC and paybacks from 2005 onward. Associated with the agreement was a decision by the Panel to apply the new calculation method to 2002, 2003 and 2004. Whereas the traditional method used post-season estimates of run size, spawning escapement and test fishing catch in the calculation, the new method uses the estimates of run size, spawning escapement target, management adjustment and test fishing catch that were in effect when the Panel relinquished control of the last U.S. Panel Area (October 4 in 2003). The new method is therefore based on in-season data rather than post-season data to calculate the total sockeye available for sharing. In the context of assessing the achievement of objectives, this premise is applied not only to TAC and catch allocation targets, but also to escapement and True Late-run objectives.

A. Escapement

The Panel's first objective is to achieve the spawning escapement targets for each run-timing group. Spawning escapement targets for Early Stuart, Early Summer, Summer and True Late-run sockeye were determined by applying Canada's spawning escapement plan (Appendix A, Table 2) to the in-season run-size updates for each run-timing group. Spawning escapement targets for Fraser River pink salmon were similarly established. The objective (as a percentage of run size) established for Summer-run sockeye was applied to the Birkenhead run.

In-season escapement targets may also include additional fish in a category called a "Management Adjustment" (MA). Management adjustments are designed to increase the likelihood of successfully achieving the spawning escapement targets. They are based on statistical models that consider the historical differences between in-season projections of spawning escapement based on estimates of Mission escapement minus catch above Mission (i.e., potential spawning escapement"), and post-season estimates based on spawning ground enumeration programs. For Early Stuart, Early Summer and Summer-run stocks, the models relate historical differences between estimates (DBEs) to the severity of river conditions measured near Hells Gate. When discharge levels or temperatures are high, then differences between estimates also tend to be high. In addition, for Early Stuart and Early Summer runs, in-season estimates are consistently higher than spawning ground estimates even when migration conditions are in a normal range, and this tendency is also captured by the MA models. For True Late-run sockeye,

historical differences between estimates are related to the date when half the run has migrated past Mission (i.e., 50% date), which captures the effect of the early migration observed in recent years on the migration success of these stocks.

Final in-season spawning escapement targets are shown in Table 16, along with spawning ground estimates of escapement. Spawning escapements to the Early Stuart system showed the largest shortfall, with total escapement less than half (55% lower) the target. Early Summer, Summer and True Late runs achieved escapements that were slightly below the targets (6-15% lower). In contrast, the spawning escapement of Birkenhead sockeye was more than double the target (145% higher). Overall, total spawning escapements of Fraser sockeye were only slightly below the target (2% lower).

Table 16. Comparison of in-season spawning escapement targets at the time the Panel relinquished control of the last U.S. Panel Area (Oct. 4) and spawning ground escapement estimates, for adult Fraser River sockeye and pink salmon in 2003.

	Spawning Escapement			
		Spawning	Deviation from Target	
Run	In-season Target	Ground Estimate	Fish	%
Sockeye Salmon				
Early Stuart	29,000	13,000	(16,000)	(55%)
Early Summer	207,000	194,000	(13,000)	(6%)
Summer	1,130,000	1,002,000	(128,000)	(11%)
Late	657,000	770,000	113,000	17%
Birkenhead	132,000	324,000	192,000	145%
True Lates	525,000	446,000	(79,000)	(15%)
Adult sockeye	2,023,000	1,979,000	(44,000)	(2%)
Pink Salmon				
Pink salmon	7,800,000	23,931,000 **	16,131,000	207%

* Pink salmon escapement estimated by subtracting the total catch from the in-season run-size estimate.

Because of fishery restrictions to protect Early Stuart sockeye, only 1,200 Early Stuart fish were caught, primarily in test fisheries used to assess the in-season status of this stock. The 16,000 fish shortfall in Early Stuart escapement (Table 16) is consistent with the historical pattern of differences between estimates resulting from a combination of en route losses and systematic stock assessment errors. The Panel was unable to increase the escapement target with a MA to account for these expected differences in 2003, because of the low total return (Table 14), thus a shortfall resulted on the spawning grounds. For Early Summer-run fish, a MA of 147,000 fish was added to the in-season target to account for expected differences between in-season and post-season escapement estimates. Although the adjusted target of 354,000 was not achieved (Table 17), the increase to the target resulting from the MA (Table 17), combined with a smaller than expected difference between in-season and post-season escapement estimates (77,900 fish, Table 14 vs. 147,000 fish, Table 17) resulted in a spawning escapement that was only 13,000 spawners below the target (Table 16). In contrast, the in-season Summer-run potential escapement estimate of 1,747,000 fish (Table 17) was much higher than the target (1,130,000 fish), but still the spawning ground estimate was 128,000 spawners short of the target (Table 16). Panel action designed to maximize the escapement of Early Summer and True Late-run fish resulted in overages in Summer-run gross escapements to the lower river (Table 18). Historical differences and in-season environmental conditions did not warrant a management adjustment for Summer-run sockeye, however, the subsequent shortfall on the spawning grounds indicates that differences between in-season and post-season estimates were much larger than anticipated. For Birkenhead, at least some of the escapement overage is due to measures to protect True Late-run sockeye, but in addition the spawning ground estimate was larger than the Mission-based estimate. Finally, for True Late-run sockeye, despite the fact that the gross escapement target was not achieved (Table 18), the difference between estimates was smaller than expected (195,000 fish, Table 14 vs. 481,000 fish, Table 17), so the spawning escapement was only 79,000 spawners (15%) less than the target (Table 16).

Table 17. Comparison of in-season spawning escapement targets (including management adjustments) at the time the Panel relinquished control of the last U.S. Panel Area (Oct. 4) and in-season spawning escapement estimates, for adult Fraser River sockeye salmon in 2003.

	Spawning Escapement					
	In-season	Management	Adjusted	In-season Potential	Deviation from Target	
Run	Target	Adjustment*	Target	Spn.Esc.**	Fish	%
Early Stuart	29,000	0	29,000	28,000	(1,000)	(3%)
Early Summer	207,000	147,000	354,000	306,000	(48,000)	(14%)
Summer	1,130,000	0	1,130,000	1,747,000	617,000	55%
Late	657,000	481,000	1,138,000	1,088,000	(50,000)	(4%)
Birkenhead	132,000	0	132,000	248,000	116,000	88%
"True" Lates	525,000	481,000	1,006,000	840,000	(166,000)	(17%)
Adult sockeye	2,023,000	628,000	2,651,000	3,169,000	518,000	20%

* Adjustment of gross escapement targets to achieve spawning escapement goals.

** Mission escapement estimate (based on hydroacoustic and test fishing cpue data) minus catch above Mission.

For pink salmon, spawning enumeration programs were not conducted in 2003. Thus, spawning escapement estimates can only be calculated by subtracting the total catch in all fisheries from the final in-season run-size estimate. Based on this methodology, the spawning escapement of Fraser pink salmon was more than three times the target (207% higher, Table 16).

Although no longer specified as a Panel objective in the Treaty, in-season management is based on targets for gross escapement (spawning escapement targets plus management adjustments and allocations for First Nations and recreational catches in the Fraser River), rather than spawning escapement. This is partly because the Panel's mandate extends only to commercial fisheries, which have an upriver boundary of the railway bridge at Mission, BC, in the lower Fraser River. Furthermore, in-season monitoring of the progress toward gross escapement targets is more practical because of the large time lags that occur between management actions and arrivals on the spawning grounds. Based on final in-season estimates of gross escapement, Early Stuart gross escapement targets were achieved, Early Summer and True Late-run gross escapements were slightly lower than the targets (15% and 19% lower), while Summer-run and Birkenhead escapements were much higher than the targets (35% and 71%, Table 18). These results indicate that while Summer-run and Birkenhead targets were exceeded due to measures to restrict catches of Early Summer and True Late-run stocks, gross escapement targets for these latter stocks were not achieved due to higher than targeted harvests in commercial and marine fisheries.

Table 18. Comparison of in-season gross escapement targets (including management adjustments) at the time the Panel relinquished control of the last U.S. Panel Area (Oct. 4) and in-season gross escapement estimates, for adult Fraser River sockeye salmon in 2003.

	Gross Escapement					
	In-season	Management	Adjusted	In-season	Deviation from Target	
Run	Target	Adjustment*	Target	Estimate**	Fish	%
Early Stuart	29,000	0	29,000	29,400	400	1%
Early Summer	307,000	147,000	454,000	384,000	(70,000)	(15%)
Summer	1,645,000	0	1,645,000	2,225,600	580,600	35%
Late	793,000	481,000	1,274,000	1,168,500	(105,500)	(8%)
Birkenhead	152,000	0	152,000	260,300	108,300	71%
"True" Lates	641,000	481,000	1,122,000	908,200	(213,800)	(19%)
Adult sockeye	2,774,000	628,000	3,402,000	3,807,500	405,500	12%

* Adjustment of gross escapement targets to achieve spawning escapement goals.

** Mission escapement estimate (based on hydroacoustic and test fishing cpue data) plus First Nations catch in the Fraser River below Mission. Includes 197,000 sockeye caught in Fraser River First Nations' fisheries below Mission, B.C.

B. Late-run Objective

For True Late-run sockeye, an exploitation rate limit was employed in addition to the spawning escapement target discussed above. Management actions through most of the season were predicated on a 25% True Late-run exploitation rate objective. Late in the season, due to an earlier than expected upstream migration of True Late-run sockeye, this limit was reduced to 15%. Based on a catch of 378,000 True Late-run sockeye in all fisheries, the exploitation rate was 32% or about twice the limit (Table 19).

Table 19. Comparison of the in-season catch estimate to the 15% exploitation rate limit for True Late-run sockeye in 2003.

Item	% of Run	Fish
True Late run (final in-season)		1,183,000
Exploitation rate limit (final in-season)	15%	177,000
Catch	32%	378,000
Deviation	17%	201,000

C. International Allocation

The Panel's second priority is to achieve the goals for international allocation of the Total Allowable Catch (TAC). For 2002 and 2003, a new method of calculating the TAC was implemented as a result of the February 17, 2005 agreement. The key element of the new calculation method is that the final in-season spawning escapement target replaces the actual spawning escapement estimate as the escapement deduction. This agreement led to TAC and share calculations that differed from past practices in the following ways:

1. The run size is the in-season accounted run-size estimate on the date that the Panel relinquished control of the last U.S. Panel Area (October 4, 2003), rather than the final post-season estimate.
2. The spawning escapement deduction is the in-season spawning escapement target, instead of the actual spawning escapement estimate as in past years.
3. In-season management adjustments are included as deductions. In past years, the management adjustment was dropped from the post-season TAC calculation when the actual spawning escapement became the escapement deduction.

With the total run size of 5,408,000 Fraser sockeye minus the deductions for spawning escapement, management adjustment, Fraser River Aboriginal Exemption and test fishing catch, the TAC in 2003 was 2,249,000 sockeye (Table 20). Washington's share was 16.5% of the TAC minus a payback of 9,000, for a total share of 362,000 fish. Subtracting their catch of 244,000 fish from this share leaves a catch shortfall of 118,000 sockeye. Canadian fishers caught 1,518,000 sockeye (excluding the Fraser River Aboriginal Exemption of 400,000 sockeye and an ESSR catch of 10,000), leaving a catch shortfall of 369,000 sockeye.

In regards to Fraser River pink salmon, the run size of 26,000,000 fish minus the deductions left a TAC of 18,157,000 fish. Washington's share of this number was 25.7% plus a payback of 21,000 fish, for a total share of 4,687,000. Washington fishers caught 811,000 fish, leaving a catch shortfall of 3,876,000 fish. Canadian fishers caught 1,216,000 fish, leaving a catch shortfall of 12,254,000 pink salmon.

Table 20. Total allowable catch and international shares for Fraser River sockeye and pink salmon in 2003. In-season estimates of run size, spawning escapement target, management adjustment and test fishing catch at the time the Panel relinquished control of the last U.S. Panel Area (Oct. 4) were used, according to the revised Annex IV agreed to on Feb. 17, 2005.

		Sockeye	Pink
TOTAL ALLOWABLE CATCH			
In-season Total Run Size	*1*	5,408,000	26,000,000
Deductions			
In-season Spawning Escapement Target	*1*	2,023,000	7,800,000
In-season Management Adjustment	*1*	628,000	-
Aboriginal Fishery Exemption		400,000	-
In-season Test Fishing Catch		108,000	43,000
Total Deductions:		3,159,000	7,843,000
Total Allowable Catch:		2,249,000	18,157,000
UNITED STATES			
Washington Catch		244,000	811,000
Washington Share			
Washington Share	*2*	371,000	4,666,000
Payback	*3*	(9,000)	21,000
Total Share:		362,000	4,687,000
Deviation:	*4*	(118,000)	(3,876,000)
In-season Alaska Catch		0	0
Total United States Catch:		244,000	811,000
CANADA			
Canadian Catch - AF Exemption - ESSR Catch	*5*	1,518,000	1,216,000
Canadian Share		1,887,000	13,470,000
Deviation:	*4*	(369,000)	(12,254,000)

1 By Panel agreement (Feb. 17, 2005), the TAC calculation was fixed on the date the Panel relinquished control of the last U.S. Panel Area (Oct. 4). This means the run size, spawning escapement target, management adjustment, Aboriginal Fishery Exemption and test fishing deduction were frozen on this date. The one exception to this practice occurs if total in-river and marine Aboriginal Fishery catches are less than 400,000 fish, in which case the Treaty-defined Exemption of 400,000 fish is replaced by the actual Aboriginal Fishery catch.

2 United States share according to revised Annex IV of the Pacific Salmon Treaty.
Sockeye: 16.5% of the TAC - payback (maximum 5% of share).
Pink: 25.7% of the TAC - payback (maximum 5% of share).

3 Paybacks used for in-season TAC calculations are based on calculation method in effect at the time.

4 By agreement of the Parties (Feb. 17, 2005), no additional paybacks of overages or underages are due as a result of these calculations, for 2002, 2003 and 2004.

5 ESSR catch of 10,000 Weaver sockeye subtracted from Canadian catch.

D. Domestic Allocation

The third priority of the Panel is to achieve domestic allocation goals as specified by the Parties. The Panel's ability to achieve these goals is limited because the Panel manages only commercial fisheries in Panel Areas that are directed at Fraser River sockeye and pink salmon. Canada regulates Canadian commercial net fisheries in non-Panel areas such as Johnstone Strait, and First Nations and recreational fisheries in all fishery areas.

In 2003, the Panel was relatively successful in achieving sockeye allocation targets between Treaty Indian and Non-Indian fishers in Washington. Treaty Indian fishers caught 7,700 fish less than their target of 167,000 fish, while Non-Indian fishers caught 7,700 fish over their target of 76,000 fish (Table 21). Within the Non-Indian group, purse seines and reefnets caught 2,900 and 3,400 fish more than the targets, respectively, while gillnets caught 6,300 fish less. There were no specific allocations within Treaty Indian fishers.

Table 21. Preliminary estimates of domestic overages and underages in Washington catches of Fraser River sockeye salmon in 2003.

User Category	Actual Catches Fish	%	Catch Goals Fish	%	Overage/ (Underage)
Non-Indians: by Gear					
Purse Seine	48,300	57.5%	45,400	54.0%	2,900
Gillnet	28,100	33.5%	34,400	41.0%	(6,300)
Reefnet	7,600	9.0%	4,200	5.0%	3,400
Total:	84,000	100.0%	84,000	100.0%	0
Washington: between Treaty Indian and Non-Indian Users *					
Treaty Indian	159,700	65.5%	167,400	68.7%	(7,700)
Non-Indian	84,000	34.5%	76,300	31.3%	7,700
Washington Total:	243,700	100.0%	243,700	100.0%	0

* TI share = 67.7% - 23/56 of the 9,000 U.S. payback.
NI share = 32.3% - 33/56 of the 9,000 U.S. payback.

In Canada, Area B purse seines were 61,000 fish over, Area D gillnets were 17,000 fish over, Area E gillnets were 52,000 fish under and Area H trollers were 26,000 fish under their respective allocations of Fraser sockeye (Table 22).

Table 22. Preliminary estimates of domestic overages and underages in Canadian catches of Fraser River sockeye salmon in 2003.

Gear License Area	Actual Catches Fish	%	Catch Goals Fish	%	Overage/ (Underage)
Purse Seine					
A Northern	0	0.0%	0	0.0%	0
B Southern	486,600	47.0%	424,900	41.0%	61,700
Total	486,600	47.0%	424,900	41.0%	61,700
Gillnet					
D Johnstone Strait	167,100	16.1%	150,200	14.5%	16,900
E Fraser River	258,600	25.0%	310,900	30.0%	(52,300)
Total	425,700	41.1%	461,100	44.5%	(35,400)
Troll					
F Northern	0	0.0%	0	0.0%	0
G Southern	0	0.0%	0	0.0%	0
H Inside	123,900	12.0%	150,200	14.5%	(26,300)
Total	123,900	12.0%	150,200	14.5%	(26,300)
Total	1,036,200	100.0%	1,036,200	100.0%	0

In terms of the achievement of Washington catch goals for Fraser pink salmon (Table 23), the catch was to be split equally between Treaty Indian and Non-Indian groups. Treaty Indian fishers caught 66,000 fewer fish than the target of 386,000, while Non-Indian fishers caught 66,000 more fish than the target.

Table 23. Preliminary estimates of domestic overages and underages in Washington catches of Fraser River pink salmon in 2003.

User Category	Actual Catches		Catch Goals		Overage/
	Fish	%	Fish	%	(Underage)
Washington: between Treaty Indian and Non-Indian Users					
Treaty Indian	320,300	41.5%	385,900	50.0%	(65,600)
Non-Indian	451,500	58.5%	385,900	50.0%	65,600
Washington Total:	771,800	100.0%	771,800	100.0%	0

The achievement of Canadian targets for pink salmon allocation (Table 24) were less successful. Area B purse seines were 222,000 fish over, Area D gillnets were 17,000 fish under, Area E gillnets were 10,000 fish over, Area G trollers were 184,000 under and Area H trollers were 31,000 fish under their respective allocations of Fraser River pink salmon.

Table 24. Preliminary estimates of domestic overages and underages in Canadian catches of Fraser River pink salmon in 2003.

Gear License Area	Actual Catches		Catch Goals		Overage/
	Fish	%	Fish	%	(Underage)
Purse Seine					
A Northern	0	0.0%	0	0.0%	0
B Southern	721,600	86.6%	500,000	60.0%	221,600
Total	721,600	86.6%	500,000	60.0%	221,600
Gillnet					
D Johnstone Strait	16,200	1.9%	33,000	4.0%	(16,800)
E Fraser River	18,100	2.2%	8,000	1.0%	10,100
Total	34,300	4.1%	41,000	5.0%	(6,700)
Troll					
F Northern	0	0.0%	0	0.0%	0
G Southern	600	0.1%	184,100	22.0%	(183,500)
H Inside	76,600	9.2%	108,000	13.0%	(31,400)
Total	77,200	9.3%	292,100	35.0%	(214,900)
Total	833,100	100.0%	833,100	100.0%	0

E. Conservation of Other Stocks

Due to restricted fishing in Canadian areas in Juan de Fuca Strait (Area 20) and other areas, catches of non-target species and stocks in Panel Area fisheries directed at Fraser River sockeye were low (Table 25). The recorded by-catches totalled 90 non-Fraser sockeye, 86,000 non-Fraser pink, 11,400 chinook, 3,600 coho, 500 chum and 50 steelhead.

Table 25. Preliminary estimates of catches of non-Fraser sockeye and pink salmon and of other salmon species in commercial fisheries regulated by the Fraser River Panel in 2003.

Area and Gear	Non-Fraser		Fraser and Non-Fraser			
	Sockeye	Pink	Chinook	Coho	Chum	Steelhead
United States *						
Areas 4B, 5 and 6C Net	90	11,100	900	2,800	400	50
Areas 6, 7 and 7A Net	0	73,900	4,800	800	20	0
Total	90	85,000	5,700	3,600	420	50
Canada **						
Area 20 Net	0	1,100	0	0	10	0
Area 29 Net	0	0	5,700	0	70	0
Total	0	1,100	5,700	0	80	0
Total	90	86,100	11,400	3,600	500	50

* Estimates are from the WDFW "soft-system".

** Estimates are from DFO in-season hail program.

X. ALLOCATION STATUS

With the payback agreements that were in place in 2003, the United States repaid the remaining balance of 9,000 sockeye carried forward from 2002, and Canada repaid the remaining balance of 21,000 pink salmon they owed from 2001 (Table 20). The Panel agreed, however, that no paybacks would be carried forward to future years (Table 26) due to overages or underages in 2003.

Table 26. Allocation status of Fraser River sockeye and pink salmon for 1999-2003.

	Sockeye					Pink		
	1999	2000	2001	2002	2003	1999	2001	2003
TOTAL ALLOWABLE CATCH								
Total Run Size	3,643,000	5,217,000	7,213,000	15,312,000	5,408,000	3,616,000	21,293,000	26,000,000
Escapement and other deductions	3,438,000	3,198,000	6,132,000	9,568,000	3,159,000	3,468,000	19,881,000	7,843,000
Total Allowable Catch:	205,000	2,019,000	1,081,000	5,744,000	2,249,000	148,000	1,412,000	18,157,000
UNITED STATES								
Washington Catch	20,000	494,000	241,000	449,000	244,000	17,000	445,000	811,000
Washington Share *	46,000	412,000	241,000	496,000	362,000	38,000	445,000	4,687,000
Deviation:	(26,000)	82,000	0	(47,000)	(118,000)	(21,000)	0	(3,876,000)
Cumulative Allocation Status:	(26,000)	56,000	56,000	9,000	0 **	(21,000)	(21,000)	0 **

* Washington share of the TAC according to Annex IV of the Pacific Salmon Treaty:
1999: Shall not exceed 22.4% for Fraser sockeye and 25.7% for Fraser pinks.
2000: Shall not exceed 20.4% for Fraser sockeye.
2001: Washington share equals Washington catch for Fraser sockeye and pink salmon, by agreement between the Parties on June 12, 2002.
2002: The Washington share equals the Washington catch plus the maximum payback, in accordance with the Feb. 12-13, 2003, Panel agreement.
2003: Shall not exceed 16.5% for Fraser sockeye minus the payback, and 25.7% for Fraser pinks plus the payback.

** By Panel agreement, no paybacks are to be carried forward for either sockeye and pink salmon.

XI. APPENDICES

APPENDIX A: 2003 PRE-SEASON FORECASTS AND SPAWNING ESCAPEMENT TARGETS FOR FRASER RIVER SOCKEYE AND PINK SALMON

Table 1. Pre-season forecasts for Fraser River sockeye and pink salmon. (Provided to the Panel by Fisheries and Oceans Canada on February 12-13, 2003).

Stock/Timing	Probability of Achieving Specified Run Sizes [a]				
	25%	50%	75%	80%	90%
Early Stuart	**139,000**	**89,000**	**57,000**	**51,000**	**38,000**
Early Summer	**748,000**	**412,000**	**225,000**	**196,000**	**133,000**
Fennell	87,000	46,000	25,000	21,000	14,000
Bowron	52,000	31,000	18,000	16,000	11,000
Raft	46,000	27,000	16,000	14,000	10,000
Gates	42,000	25,000	16,000	14,000	10,000
Nadina	66,000	37,000	21,000	18,000	13,000
Pitt	138,000	82,000	49,000	43,000	30,000
Seymour	113,000	61,000	32,000	28,000	18,000
Scotch	37,000	16,000	6,000	5,000	3,000
Miscellaneous	167,000	87,000	42,000	37,000	24,000
Summer	**5,775,000**	**3,360,000**	**1,988,000**	**1,749,000**	**1,246,000**
Chilko	2,063,000	1,323,000	849,000	760,000	566,000
Quesnel	2,188,000	1,168,000	624,000	534,000	352,000
Stellako	897,000	595,000	395,000	357,000	272,000
Late Stuart	627,000	274,000	120,000	98,000	56,000
Late	**3,082,000**	**1,641,000**	**871,000**	**746,000**	**491,000**
Birkenhead	575,000	322,000	180,000	156,000	106,000
Late Shuswap	1,863,000	991,000	527,000	451,000	297,000
Cultus	18,000	9,000	5,000	4,000	3,000
Portage	90,000	41,000	19,000	15,000	9,000
Weaver	370,000	191,000	98,000	83,000	53,000
Misc. Shuswap	100,000	52,000	25,000	22,000	14,000
Misc. non-Shuswap	66,000	35,000	17,000	15,000	9,000
Total	**9,744,000**	**5,502,000**	**3,141,000**	**2,742,000**	**1,908,000**
Pinks	**25,504,000**	**17,273,000**	**11,698,000**	**10,605,000**	**8,144,000**

a Probability that the actual run size will exceed the specified projection.

Table 2. Fraser River sockeye and pink salmon spawning escapement target plan (thousands) for 2003, based on combining versions of the plan used for pre-season planning and updates provided by Canada prior to the fishing season.

Stock Group	Forecast Return (*a*)	Run Size Reference Points (*b*)	Escapement target	Harvest Rate Guidelines
Early Stuart	**57**	0 - 75	**57**	0%
		75 - 107		0 - 30%
		107 - 214		30 - 65%
		>214		65%
Early Summer		0 - 124		0 - 15%
		124 - 300		15 - 65%
	412	>300	**144**	65%
Summer		0 - 1,428		0 - 30%
		1,428 - 2,857		30 - 65%
	3,360	>2,857	**1,176**	65%
Birkenhead		0 - 133		0 - 15%
	322	133 - 323	**113**	15 - 65%
		>323		65%
Late (c)		0 - 618		0 - 15%
		618 - 1,319		15 - 25%
	1,319	>1,319	**525**	25%
Total Sockeye	**5,470**		**2,015**	
Pink		0 - 7,059		0 - 15%
		7,059 - 17,143		15 - 65%
	17,273	>17,143	**6,000**	65 - 70%

a Point estimates based on a 50% (75% for Early Stuart) probability that the actual run size will be above the forecast return.

b Reference points based on harvest rate guidelines.

c In anticipation of continued high in-river mortality associated with early entry of the Late run into the Fraser River, actual harvest rates will reflect measures to protect late run stocks.

APPENDIX B: GUIDELINES FOR PRE-SEASON FRASER SOCKEYE FISHING PLANS TO ADDRESS LATE-RUN CONCERNS

June 5, 2003

GUIDELINES FOR PRE-SEASON FRASER SOCKEYE FISHING PLANS TO ADDRESS LATE-RUN[1] CONCERNS

The 2003 cycle is the sub-dominant cycle for Adams River sockeye. Management actions/objectives implemented in 2003 will be designed to preserve future options to maintain this stock's status, as well as the status of co-migrating Late-run stocks. A coordinated approach to management will be developed that reflects both Parties sharing the burden of conservation.

ASSUMPTIONS

1. For fisheries planning purposes, it was assumed that Late-run sockeye will continue the early upstream migration behaviour and associated en route mortality that has occurred in recent years. A 50% upstream migration of September 12 was adopted based on recent Late-run behaviour observed in Late Shuswap dominant and sub-dominant cycle lines, along with the associated en route mortality of 47%, as derived from the Management Adjustment model.
2. There is good capability to assess key parameters in-season, such as run size, migration timing, etc. for Summer-run sockeye, and reduced capacity to assess these parameters for Late-run sockeye. PSC staff will advise the Panel on the in-river migration timing and the associated en route mortality of Late-run sockeye.
3. An approach to management that is responsive to in-season information will guide the FRP in 2003 in the pursuit of its' objectives.
4. The pre-season fishing plan will assume a 10 day separation in the 50% marine migration timing between Summer-run and Late-run sockeye (historical average timing difference for this cycle line for the years 1975 to 1999).

ELEMENTS OF THE PLAN

- Based upon pre-season information and assumptions, fishery impacts on Late-run sockeye will be limited according to agreed upon Late-run objectives described in the table below. Policy decisions about Late-run harvest during the in-season management period will depend on assessments of Late-run abundance, in-river migration timing, and associated en route loss projections.
- In-season decisions about Late-run sockeye harvest will vary according to in-season estimates of Late-run abundance, in-river migration timing, and associated en route mortality, described in the table below.

Late-run Objectives

In-river Mortality Rate on Late-run > 47%, or Abundance < P-50% level	In-river Mortality Rate on Late-run < 47%, and/or Abundance > P-50% level
Exploitation Rate will be reduced from 25% down to a range between 15% and 25% based on Canada's escapement target (see Attachment 1).	Consideration will be given to increasing Exploitation Rate to levels exceeding 25% consistent with meeting Canada's Late-run escapement target.

- Fisheries directed at Fraser River pink salmon will take into account Late-run sockeye concerns.

[1] Late-run here refers to the Late-run timing group, excluding Birkenhead sockeye.

APPENDIX C: LATE-RUN SOCKEYE STUDIES IN 2003

(Note: information in this Appendix was extracted from English et al. (2004) and presentations provided to the Fraser River Panel by Late-run researchers at the January 2003 and February 2004 meetings)

Introduction

Background

Late-run sockeye have historically delayed in the lower Strait of Georgia for four to six weeks prior to entering the Fraser River en route to their spawning grounds. Since 1996, Late-run sockeye (excluding Birkenhead sockeye) have often entered the Fraser River with little or no delay, which has resulted in mortality rates of some Late-run sockeye stocks exceeding 90% in some years. The cause(s) of this early entry behaviour has not yet been identified, despite intensive and on-going research studies. Some of the most serious implications of this early entry behaviour of Late-run sockeye are that: (1) the future viability of some Late-run stocks may be jeopardized; and (2) substantially lower exploitation rates on Late-run and Summer-run sockeye (a portion of which overlap in their migration timing with Late-run fish) have been necessary in recent years to help ensure that Late-run sockeye stocks are conserved. The greatly reduced exploitation rate on Fraser River sockeye is having significant adverse impacts on the multitude of commercial and non-commercial users of this resource. The severe curtailment of harvest has been necessary to protect the sustainability of Late-run stocks, including the famous Adams River sockeye run.

Migration Behaviour of Late-run Fraser River Sockeye in 2003

In 2003, as in recent past years, early entry of Late-run Fraser River sockeye stocks into the Fraser River occurred. The Late-run return was predominantly comprised of Late Shuswap sockeye, since 2003 is the subdominant cycle line return for the famed Adams River sockeye population. Late-run sockeye were first identified in DNA analyses of sockeye tissue samples collected from the Whonnock gillnet test fishery (Fraser River, Area 29-16) on July 31 and the first Cultus sockeye passed through the Sweltzer Creek fish fence on August 5, which confirmed the continuation of the early upstream migration behaviour. As the migration progressed, the majority of Late-run fish entered the Fraser River with little or no delay, unlike 2002 when marine assessments indicated that a substantial portion of the run delayed in the Strait of Georgia.

As the Late-run sockeye migration progressed through August, a component of the run showed a normal behaviour pattern and delayed in the Strait of Georgia. The delaying fish began migrating into the Fraser River in early September, when an estimated 300,000 Late-run sockeye migrated past Mission between September 1 and September 14. The migration tapered off sharply after this date and the run had virtually completed it's upstream migration by September 22. The date when 50% of Late-run sockeye were estimated to have migrated past Mission was August 28, which is approximately one month earlier than the long-term average date.

The entry pattern of Late-run sockeye into the Fraser River in 2003 was different than the 1999 brood year when a much larger fraction of the migration (72% in 1999 vs. 41% in 2003) occurred in September. The 50% upstream migration date of Late Shuswap sockeye past Mission in 1999 was September 7, and approximately 65% of Late Shuswap sockeye were estimated to have died en route between Mission and their natal spawning areas. In 2003, in spite of the fact that the 50% migration date past Mission was nearly two weeks earlier (August 27), a much smaller fraction of the run died en route (approximately 15% based on comparison of hydroacoustic estimates of Late-run sockeye past Mission and upstream accounting estimates from spawning grounds; 35% based on radio-tagging, see below). The reasons for the lower mortality rate in 2003 are unknown. The lower mortality rate is unlikely to be associated with environmental conditions, however, because Fraser River temperatures were less favorable (higher) during upstream migration in 2003 than in 1999, and so would tend to have the opposite effect on mortality rate than what was observed.

The Pacific Salmon Commission funded several studies in 2003 directed at improving understanding of the dynamics of the early upstream migration behaviour of Late-run sockeye, and at testing hypotheses to determine mechanisms causing the abnormal behaviour of Late-run sockeye observed in recent years. The research plan was coordinated by the Committee on Scientific Cooperation (CSC) of the PSC, with total funding of approximately $650,000 (Cdn.) contributed by Canada and the United States. In addition, 2003 marked the first year of a 5 year National Sciences and Engineering Research Council Grant (NSERC) to Dr. Scott Hinch of the University of British Columbia to investigate the Late-run problem. A summary of the research conducted in 2003 is presented below.

Summary of Studies Conducted on Late-run Fraser River Sockeye in 2003

Radio Tagging and Telemetry

A large-scale radio tagging study was conducted by LGL Limited which was similar to the 2002 study.

Tagging objectives:

1. Assess river entry timing of each ocean timing component for Late-run sockeye.
2. Estimate the amount of delay of Late-run sockeye in the Strait of Georgia by timing group.
3. Estimate in-river survival and spawning success of Late-run sockeye by timing group.
4. Bio-sample radio-tagged fish for physiological study.

Nearly 560 radio-tagged Fraser River sockeye were released in ocean approach areas. Late-run sockeye accounted for 34% of those releases. Tagged Late-run sockeye were released in early, mid, and late timing groups. In contrast to the 2002 study all fish were captured and released in Johnstone Strait. Approximately 430 of these tagged fish were physiologically sampled prior to release. A total of 178 acoustically tagged sockeye were released in Johnstone Strait during the latter two release periods and approximately half of these fish were physiologically sampled prior to release. An additional 79 radio-tagged fish were released in the Thompson River near Ashcroft (approximately 35 km downstream from Kamloops Lake).

Results:

- The marine area survival rates of radio-tagged fish released in the marine areas varied among the 3 release groups. Estimates of survival from the telemetry data in four of the six groups ranged from 46-68%. These survival estimates are consistent with other marine tagging studies.
- The reason for the low survival rate of the first release group is unknown. However, the pattern was similar to that found in 2002 when survival rates were lower for tagged fish that were released when the abundance of sockeye in the release areas was low based on DFO and PSC test fishing data. It is unclear if tagging-effects reduced the survival of tagged fish. Alternatively, the hypothesis that low survival of both tagged and untagged fish occurred in Johnstone Strait at that time cannot be rejected.
- A similar proportion of tagged and physiologically sampled fish versus fish that were only tagged were tracked to Mission (65% vs. 69%) indicating that the added effect of physiological sampling was minimal.
- Marine-tagged Summer-run sockeye (as identified through DNA analysis) generally entered the Fraser River in the same chronological order as they were tagged. The travel times between Johnstone Strait and Mission for the 1st, 2nd and 3rd release timing groups were similar.
- River entry timing of marine-tagged Late-run fish was more variable and protracted compared to Summer-run fish. On average, Late-run fish had travel times from Johnstone Strait to the lower Fraser River of about 12 days compared to 6 days for Summer-run fish.
- Most Late-run sockeye from each release group entered the Fraser River with little or no delay in the Strait of Georgia and at the same time as the Summer-run fish. Of the three release groups, higher proportions (77%) of Late-run sockeye in the 1st group entered the river early. The proportion that entered early declined slightly in the 2nd (61%) and 3rd (57%) release groups. The amount of delay declined successively between the 1st, 2nd and 3rd release groups.
- In-river survival in 2003, which excludes pre-spawn losses in terminal spawning areas, was lower for the first Summer-run release group, but similar for the latter two release groups

(67% vs. 86% and 82%). The in-river survival of Late-run fish showed a similar pattern, but with lower survival varying from 48% in the 1st release group to 66 and 69% for the 2nd and 3rd release groups. The overall survival estimates for Late-run sockeye in 2003 were similar to estimates based on Mission acoustic abundance estimates (40% vs. 45%), but much higher than survival estimates for Weaver Creek sockeye in 2000 and 2001 when survival was estimated at about 10%. However, survival estimates for component Late-run stocks varied among techniques (83% based on Mission and upstream data compared to 57% based on tagging for Late-Shuswap; and 30% based on Mission and upstream data compared to 53% based on tagging for Weaver sockeye).

- In-river survival was very low for Late-run fish that entered the river earliest. Late-run sockeye that passed Mission before August 31 had an in-river survival rate of 39%, whereas after September 11 the survival rate was 92%.
- The overall survival rate from Mission to the spawning areas, excluding likely in-river fishery removals, was 63% for Late-run sockeye and 77% for Summer-run fish.
- The radio telemetry data for Late-run sockeye in 2002 and 2003 suggests a relationship between river entry timing and survival from Mission to the spawning grounds for Late-run sockeye.
- The relationships describing in-river survival by time of river entry based on telemetry data reveal an increase in survival with date of passage. Late-run sockeye that passed Mission before August 21, had an in-river survival rate in 2002 and 2003 of < 20%. Survival rates increased rapidly for Late-run sockeye that passed Mission from late-August to early September. Late-run sockeye that passed Mission after September 11 in both years had survival rates of > 90%.
- It is important to note that the sample size of Late-run sockeye that passed Mission before August 21 was low in both years (20 fish in 2002 and 8 in 2003). Consequently, the in-river survival estimate for the early entry group had low precision and was potentially inaccurate.
- The survival of marine radio-tagged fish and Thompson River radio-tagged fish was similar for fish that passed the Thompson in August. However, fish tagged in the Thompson River in September had a much lower survival rate than co-migrating marine tagged fish. The very low survival rate of these latter tagged fish in the Thompson might have been due to greater susceptibility to tagging and handling effects than those tagged in August. A number of fish tagged during this period showed excessive bleeding during surgery, suggesting poor blood clotting capability.
- The low numbers of radio-tagged carcasses recovered from spawning sites precluded rigorous evaluation of spawning success by timing group based on radio-tag recoveries.

Oceanography

Oceanographic work in 2003 continued to focus on the Brackish Layer model developed by Dr. Rick Thomson and Roy Houston from DFO's Institute of Ocean Sciences in Sidney, BC. The working hypothesis of the Brackish Layer model is that early entry is dependent on upper ocean conditions in ocean migratory areas as adults enter the Strait of Georgia. Specifically, the hypothesis contends that Late-run Fraser sockeye are more likely to proceed up-river during late summer in years which have high freshwater retention and weak vertical mixing in the upper layer. Environmental variables were used to assess processes affecting migration timing based on the concept that the upper layer of the Strait of Georgia system is, to varying degrees, an extension of the Fraser River estuary. This has been called the "Brackish Layer Depth Model" and focuses on environmental conditions in near-surface depths where salmon migrate. A long-term time series of properties or spatial extent of the surface brackish layer in the Georgia Basin does not exist. Therefore, proxy variables were used to characterize the surface brackish layer, notably surface temperature and salinity from lighthouses, but also wind and water level. To determine the temperature and salinity conditions that Late-run sockeye experience in Georgia Strait, a Conductivity, Temperature, Depth sensor (CTD) was attached to one of the lines of a PSC troll test vessel. The CTD measured temperature salinity and dissolved oxygen. Towing the CTD during the test fishing process and raising and lowering it periodically through the water column generated depth profiles of the environmental variables that were associated with the capture depth of sockeye.

Results:

- Return timing and monthly temperature (T) and salinity (S) variance are correlated.
  - High T&S variance: river water retained as a layer.
  - Low T&S variance: vertical mixing, low retention of freshwater.
- For specific time periods, there are significant statistical correlations between the peak and 50% upstream migration timing at Mission for Adams and Weaver stocks and *individual* physical variables (specifically, the variability of surface temperature and salinity) in the Georgia Basin.
- Timely availability of some surface data might allow prediction prior to the season.
- 191 CTD profiles for temperature, oxygen, and salinity were extracted from the data set collected over a 3 week period from the troll vessel.
- Sockeye were caught primarily at depths of 20-50 meters, water temperatures of 10-11°C, salinity of 30-31 parts per thousand, and oxygen levels of 4-5 micrograms/litre.
- The CTD profiles from the 2002 and 2003 data sets collected during the troll fishery will be related to historical profiles from Nanoose Bay to refine the environmental variables used in the Brackish Layer model.
- Some significant relationships between oceanographic conditions in the spring (when juveniles are entering the ocean) and up-river migration timing two years later were found.

NSERC Grant Investigations

This was the first year of the NSERC Strategic Grant of Dr. Scott Hinch and his colleagues. The $1,100,000 (Cdn.) grant will focus on three main objectives during the next five years:

1) Examine hypotheses about the physiological conditions that may be responsible for initiating up-river migrations. In particular they will focus on osmoregulation, reproductive hormones, photoreception, energy state, and parasite infection.

2) Examine hypotheses about the immediate consequences of earlier than normal migrations in order to understand why early migrants have high en route and pre-spawning mortalities.

3) Examine hypotheses about the intergenerational (e.g., fitness) consequences of earlier than normal migrations on sockeye that successfully spawn.

Results from the 2003 Research:

- Control plasma and respiratory values for marine and freshwater migrating sockeye were determined.
- Techniques for non-destructive biological sampling and fat assessments (fat-meter) proved to cause no ill effects to migrating sockeye.
- Fat-meter provided a reliable and sensitive estimate of gross somatic energy.
- A 6-day exposure to Fraser River water (Annacis holding study) infected adults with the parasite *Parvicapsula*.
- Ocean caught fish that by-passed the Fraser River and were held at Cultus Lake prevented *Parvicapsula* infection.
  i) Held at high temperatures, uninfected adults matured to spawning condition, infected adults died.
  ii) Held at low temperatures, both types survived to spawning condition.
  iii) *Parvicapsula* infection is time and temperature dependent.
- Genetic markers (detected through Polymerase Chain Reaction or PCR) rather than histology assessments (glomeruli infection rate) may be more indicative of physiological effects of *Parvicapsula*.
- *Parvicapsula* infection appears to negatively affect:
  i) ionic/osmoregulation
  ii) ability to recover for a second swim.
- Ionic status showed distinct patterns through the migration from Queen Charlotte Islands to spawning grounds.
- Gill Na, K-ATPase enzyme activities in Johnstone Strait show promise as an indicator for early entry.
- Fish holding in Georgia Strait (normal behavior) are in a declining energy status.
- Early entry of Late-run sockeye is <u>not</u> related to:
  i) low gross somatic energy in marine sockeye

ii) unusual retinal morphology in marine sockeye (no changes to UV reception)
iii) unusual plasma ions in marine sockeye (Na^+, Cl^-, & K^+)
iv) unusual levels of sex hormones in marine sockeye (testo,11-ketotesto, & estradiol).

- High en route mortality is not associated with unusual energy usage from Whonnock to Thompson Canyon.
- Surgical transmitter implantations caused high en route mortality between Thompson Canyon and spawning grounds – fish bleeding was unusually high; esophageal implantations caused little mortality.
- Blood clotting was slower for early entry fish in the Thompson Canyon.

Key findings related to Objectives

Issue - Abnormally early entry into freshwater

Ruled out the following hypotheses:

-marine fish do not enter freshwater early because: i) their energy reserves are low and are at risk of energy depletion; ii) they cannot sense UV light levels and hence cannot time the transition properly from marine to freshwater; iii) they have unusual plasma ions or sex hormones and are thus maturing early and must get to spawning grounds.

Key finding:

-early entering marine fish appear to have unusual kidney and osmoregulatory status – reasons still unknown.

Issue – High en route freshwater mortality

Key findings:

-early entering fish seem to have poorer blood clotting ability, poorer swimming performance, and high en route mortality close to spawning grounds; early fish were in poorer physiological state in Thompson Canyon.

Issue – High pre-spawning (on spawning ground) mortality

Key findings:

-limited work to date, Thompson telemetry/physio data suggest early entry fish may be running out of energy or in physiological distress upon reaching spawning grounds.

APPENDIX D: COMMISSION GUIDANCE TO THE FRASER RIVER PANEL AND PSC STAFF FOR 2003

February 14, 2003

Commission Guidance to the Fraser River Panel and PSC Staff for 2003

The purpose of this document is to provide Commission direction to the Fraser River Panel and the PSC staff for 2003 on implementing the Pacific Salmon Treaty and 1999 Revised Annexes, and on making improvements to the Fraser River Panel process. This direction is not intended to replace the Diplomatic Note of August 13, 1985 regarding implementation of Article XV (paragraph 3) of the Pacific Salmon Treaty regarding the roles and responsibilities of the Pacific Salmon Commission staff.

This guidance is also based on an expectation that the National Sections will remain fully committed to the Fraser River Panel process including: (1) that the Pacific Salmon Commission staff continue in a strong role in Fraser River sockeye and pink management; and (2) use of the structured bilateral meeting process for: receiving PSC staff advice and recommendations; adopting in-season run-size updates; and proposal and adoption of Panel water fisheries management options. The National Sections will continue to actively advise and consult with each other on a timely basis in-season with respect to their Non-Panel water fisheries targeting Fraser River sockeye and pink salmon.

An Improved Fraser River Panel Process

1) In-Season Run Size Projections and Fishery Management Recommendations

a) The mid-point forecast provided by Canada will be used for management purposes until in-season updates of run size become available. Based on advice from the Fraser River Panel Technical Committee and PSC Staff, the Panel may adopt more precautionary or optimistic applications of the forecast information until in-season updates of run size are available. PSC staff will provide the Fraser River Panel with recommendations for in-season run size and other factors relevant to sound fisheries management decisions. Based on information such as, but not limited to, in-season estimates of run timing and diversion rate, the PSC staff will make recommendations to the Fraser River Panel regarding in-season decision making.

b) PSC staff will provide the Fraser River Panel with projected harvestable surpluses and status of harvest from fisheries under Panel management. These projections will incorporate any Fraser River Panel agreement on management adjustments that deal with environmental conditions during in-river migration that could significantly impact the Fraser River Panel's ability to achieve spawning escapement objectives and other considerations agreed to by the Panel.

c) Any changes from PSC staff recommendations for points 1) a) and 1) b) above shall be based on bilateral agreement between the National Sections of the Fraser Panel. Acceptance of the PSC staff recommendation requires approval of at least one of the National Sections.

d) The respective National Sections of the Panel will develop proposed regulations for their domestic Panel Water fisheries consistent with recommendations and projections provided by the PSC staff as described in 1) a) and 1) b) as may be modified pursuant to 1) c). Either National Section may ask PSC staff for advice in designing its fisheries proposals. PSC staff will assess whether proposed fishery regulations for Panel Waters are consistent with recommendations and projections described in 1) a) and 1) b) and Panel objectives. If proposed fishery regulations are assessed to be consistent, the Fraser River Panel will adopt the Panel Water fishery recommendations. If the PSC staff advises

that a Panel Water fishery proposal is inconsistent with 1) a), 1) b), or Panel objectives, then either: (1) the Panel may adopt the proposal based on bilateral agreement or; (2) the proposing National Section may modify and re-submit its proposal.

2) Review of Improvements in Fraser River Panel Process

Following the 2003 management season, and by the February 2004 Pacific Salmon Commission Annual Meeting, the Fraser River Panel will provide a report to the Pacific Salmon Commission that includes the following:

a) a review of the outcomes and merits of the above modifications to the Fraser River Panel process in 2003; and

b) based on the experience of the 2003 season and subject to a positive review agreeable by both National Sections, the Panel shall make recommendations to the Commission for appropriate changes to the Chapter 4 Annex IV provisions and / or the Fraser River Panel guidance provided herein.

3) Computation of Fraser River Sockeye and Pink Salmon Total Allowable Catch (TAC)

a) For 2003, for the purpose of computing the TAC for sharing purposes, the Panel shall define the TAC as the aggregate Fraser River sockeye and pink runs (including any catch of Fraser River sockeye identified in Alaskan waters) after the spawning escapement targets established by application of Canada's pre-season escapement plan (subject to any adjustments specified in paragraph 3(b) of Annex IV), the agreed Fraser River Aboriginal Exemption, and the catch in Panel authorized test fisheries have been deducted.

b) For the purpose of paragraph 8 of Chapter 4, Annex IV, except as provided in (f) below, only the future U.S. shares will be adjusted for any harvest overage of the U.S. shares in 2003 and in a manner consistent with paragraph 8 of Chapter 4, Annex IV.

c) In 2003, if in-season the catch in Canada directly impedes the U.S. pursuing its in-season TAC, this circumstance will be noted in-season by the Panel including the effect Canada's catch had on impeding the U.S. pursuit of its in-season share, and will be compensated for pursuant to paragraph 8 of Annex IV.

APPENDIX E: 2003 FRASER RIVER PANEL MANAGEMENT PLAN PRINCIPLES AND CONSTRAINTS

2003 FRASER RIVER PANEL MANAGEMENT PLAN
PRINCIPLES AND CONSTRAINTS

1. Fisheries and Oceans Canada (DFO) have provided the Panel with run-size forecasts for Fraser River sockeye by run timing group. For pre-season planning purposes, the Panel used the 75%, 50%, and 25% probability (p) levels of abundance. At the 75% p level, there is a 75% probability that the return will reach or exceed 3,141,000 fish. At the 50% p level, there is a 50% probability that the return will reach or exceed 5,502,000 fish. At the 25% p level, there is a 25% probability that the return will reach or exceed 9,744,000 fish. In addition, DFO has provided the Panel with run-size forecasts for Fraser River pink salmon. At the 75% p level, there is a 75% probability that the return will reach or exceed 11,698,000 fish. At the 50% p level, there is a 50% probability that the return will reach or exceed 17,273,000 fish. At the 25% p level, there is a 25% probability that the return will reach or exceed 25,504,000 fish.

2. The Panel has identified a priority objective in 2003, which is to achieve Late-run sockeye objectives as indicated in the document "Guidelines For Pre-season Fraser Sockeye Fishing Plans to Address Late-Run Concerns".

3. The Panel has adopted a management approach for Late-run sockeye that presumes, similar to recent years, Late-run sockeye (as defined in the footnote in the document "Guidelines for Pre-season Fraser Sockeye Fishing Plans to Address Late-run Concerns") will enter the Fraser River early and a significant proportion will not survive to spawn. Late-run sockeye and Fraser River pink salmon will be managed consistent with the Panel agreed guidelines of June 5, 2003 (see attached).

4. TAC and international shares will be calculated according to the February 14, 2003 Commission Guidelines and the 1999 Annex IV, Chapter 4, of the Pacific Salmon Treaty, which limits the United States harvest (in Washington State) to 16.5% of the total allowable catch (TAC) of Fraser River sockeye salmon, while the Canadian share of the TAC is 83.5%. With respect to Fraser River pink salmon, the United States share of the TAC is 25.7%, while the Canadian share is 74.3%. Overages of Fraser River sockeye and pink salmon in previous years will be addressed.

5. Due to brood year freshwater survival concerns, the Panel has adopted a 75% probability level forecast for Early Stuart sockeye. A 50% probability level forecast for Early Summer, Summer, and Late-run sockeye was used in planning fisheries. A 50% probability level forecast for Fraser River pink salmon has also been adopted. When sufficient information is available in-season, the Panel will update the run-size estimate of Fraser River sockeye and pink salmon stocks.

6. In-season decisions of the Panel will follow guidance outlined by the Pacific Salmon Commission agreement of February 14, 2003 (see attached).

REGULATIONS

1. If the abundance of Early Summer-run sockeye salmon is approximately at the 50% probability level (412,000 fish) and the abundance of Summer-run sockeye salmon is approximately at the 50% probability level (3,360,000 fish) and the runs arrive at near normal dates, fisheries would be expected to commence as follows: United States Areas 4B, 5, and 6C – week of July 20-26; Areas 6, 7 and 7A week of July 27-August 2; Canadian Panel Waters – week of July 20-26. If the return abundances of Early Summer and Summer-run sockeye are less than the 50% probability level forecast, this could delay the commencement of, or shorten the duration of fisheries.

2. Fisheries directed at Fraser River pink salmon will be managed in accordance with the Late-run sockeye guidelines.

3. The Parties' conservation concerns for other species and stocks will be taken into account throughout the 2003 management season.

APPENDIX F: 2003 REGULATIONS

The Fraser River Panel approved regulations for the management of the Fraser River sockeye and pink salmon fishery in Panel Area waters and submitted these to the Pacific Salmon Commission. The Commission approved the Fishery Regime and Regulations and submitted these to the respective national governments for approval on June 12, 2003.

Canadian Fraser River Panel Area

In accordance with Article VI, Paragraph 5 of the Pacific Salmon Treaty, the Commission recommends to Canada the adoption of the following Fishing Regime developed by the Fraser River Panel, namely:

1. a) No person shall commercially fish for sockeye or pink salmon in Pacific Fishery Management Area 20-1, 3 and 4 with nets from the 29th day of June, 2003, to the 13th day of September, 2003, both dates inclusive.

   b) No person shall troll commercially for sockeye or pink salmon in Pacific Fishery Management Area 20-1, 3 and 4 from the 29th day of June, 2003, to the 13th day of September, 2003, both dates inclusive.

2. a) No person shall commercially fish for sockeye or pink salmon in Pacific Fishery Management Areas 17 and 18 with nets from the 29th day of June, 2003, to the 4th day of October, 2003, both dates inclusive.

   b) No person shall troll commercially for sockeye or pink salmon in Pacific Fishery Management Area 18-1, 4 and 11 from the 29th day of June, 2003, to the 4th day of October, 2003, both dates inclusive.

3. a) No person shall commercially fish for sockeye or pink salmon with nets in Pacific Fishery Management Area 29 from the 29th day of June, 2003, to the 11th day of October, 2003, both dates inclusive.

   b) No person shall troll commercially for sockeye or pink salmon in Pacific Fishery Management Area 29 from the 29th day of June, 2003, to the 11th day of October, 2003, both dates inclusive.

4. The following Fraser River Panel Area waters are excluded:

   a) High Seas westerly of the Bonilla Point-Tatoosh Island Lighthouse Line.

   b) Pacific Fishery Management Area 19, Area 20-2 and 5 to 7 and Area 29-8.

   c) Commercial troll fishing in Pacific Fishery Management Area 17, Area 18-2, 3 and 5 to 10.

During the 2003 season, the Fraser River Panel will adopt Orders establishing open fishing periods based on a 2003 Management Plan adopted by the Panel. This Plan will be designed to achieve Pacific Salmon Treaty-mandated conservation objectives, international allocations of the catch, and domestic goals of the Parties.

United States Fraser River Panel Area

In accordance with Article VI, Paragraph 5 of the Pacific Salmon Treaty, the Commission recommends to the United States Government the adoption of the following Fishing Regime developed by the Fraser River Panel, namely:

Treaty Indian Fisheries:

1. No Treaty Indian shall commercially fish for sockeye or pink salmon in Puget Sound Salmon Management and Catch Reporting Areas 4B, 5 and 6C with drift gillnets or purse seines from the 29th day of June, 2003 to the 13th day of September, 2003, both dates inclusive.

2. No Treaty Indian shall commercially fish for sockeye or pink salmon in Puget Sound Salmon Management and Catch Reporting Areas 6, 6A, 7 and 7A with nets from the 29th day of June, 2003, to the 27th day of September, 2003, both dates inclusive.

3. No Treaty Indian shall commercially fish for sockeye or pink salmon with nets in that portion of Puget Sound Salmon Management and Catch Reporting Area 7A lying westerly of a straight line drawn from the low water range marker in Boundary Bay on the International Boundary through the east tip of Point Roberts in the State of Washington to the East Point Light on Saturna Island in the Province of British Columbia from the 28th day of September, 2003, to the 4th day of October, 2003, both dates inclusive.

All-Citizen Fisheries:

1. No person shall fish for sockeye or pink salmon in Puget Sound Salmon Management and Catch Reporting Areas 4B, 5, and 6C with nets from the 29th day of June, 2003, to the 13th day of September, 2003, both dates inclusive.

2. No person shall fish for sockeye or pink salmon in Puget Sound Salmon Management and Catch Reporting Areas 6, 6A, 7 and 7A with nets from the 29th day of June, 2003, to the 27th day of September, 2003, both dates inclusive.

3. No person shall fish for sockeye or pink salmon with nets in that portion of Puget Sound Salmon Management and Catch Reporting Area 7A lying westerly of a straight line drawn from the low water range marker in Boundary Bay on the International Boundary through the east tip of Point Roberts in the State of Washington to the East Point Light on Saturna Island in the Province of British Columbia from the 28th day of September, 2003, to the 4th day of October, 2003, both dates inclusive.

The following Fraser River Panel Area waters and fisheries are excluded:

Treaty Indian and All-Citizen Fisheries:

1. High Seas westerly of the Bonilla Point-Tatoosh Island Lighthouse Line.

2. Puget Sound Salmon Management and Catch Reporting Areas 6B, 6D, 7B, 7C, 7D and 7E.

During the 2003 season, the Fraser River Panel will adopt Orders establishing open fishing periods based on a 2003 Management Plan adopted by the Panel. This Plan will be designed to achieve Pacific Salmon Treaty-mandated conservation objectives, international allocations of the catch, and domestic goals of the Parties.

APPENDIX G: 2003 FRASER RIVER PANEL IN-SEASON ORDERS

To provide for adequate escapement of the various stocks of Fraser River sockeye and pink salmon and for the prescribed allocation of catch: (a) internationally, between the United States and Canada and (b) domestically, among the commercial user groups in Canada and the United States, the Fraser River Panel formulated the following orders to regulate Panel Area fisheries in 2003.

July 25 United States:

Treaty Indian Fishery

Areas 4B, 5 and 6C:

Open to drift gillnets 4:00 p.m., Friday, July 25, 2003, to 12:00 p.m. (noon) Wednesday, July 30, 2003.

July 29 Canada:

Area 18-1,4 and 11; and Area 29-1 to 6:

Open to Area H troll Individual Quota Project Fishery 12:01 a.m., Wednesday, July 30, 2003 until further notice.

Area 18-1,4 and 11; and Area 29-1 to 6:

Open to Area H troll Full Fleet Fishery 12:01 a.m., Thursday, July 31, 2003 until further notice.

United States:

Treaty Indian Fishery

Areas 4B, 5 and 6C:

Extended for drift gillnets from 12:00 p.m. (noon) Wednesday, July 30, 2003 to 12:00 p.m. (noon) Saturday, August 2, 2003.

Areas 6, 7, and 7A:

Open to net fishing from 11:00 a.m., Wednesday, July 30, 2003 to 11:00 a.m., Thursday, July 31, 2003.

All-Citizen Fishery

Areas 7 and 7A:

Open to gillnets from 12:00 p.m. (noon) to 11:59 p.m., Thursday, July 31, 2003.

Areas 7 and 7A:

Open to purse seines from 7:00 a.m. to 7:00 p.m., Friday, August 1, 2003.

Areas 7 and 7A:

Open to reefnets from 9:00 a.m. to 9:00 p.m., Thursday, July 31, 2003.

August 1 Canada:

Area 29-1 to 7 and 9 to 17:

Open to Area E gillnets from 7:00 a.m. to 9:00 p.m., Tuesday, August 5, 2003.

United States:

Treaty Indian Fishery

Areas 4B, 5, and 6C:

Extended for drift gillnets from 12:00 p.m. (noon) Saturday, August 2, 2003 to 12:00 p.m. (noon) Wednesday, August 6, 2003.

Areas 6, 7, and 7A:
Open to net fishing from 4:00 a.m., Monday, August 4, 2003 to 7:30 a.m., Wednesday, August 6, 2003.

All-Citizen Fishery
Areas 7 and 7A:
Open to gillnets from 8:00 a.m. to 11:59 p.m., Wednesday, August 6, 2003 and from 8:00 a.m. to 11:59 p.m., Friday, August 8, 2003.

Areas 7 and 7A:
Open to purse seines from 5:00 a.m. to 9:00 p.m., Thursday, August 7, 2003 and from 5:00 a.m. to 9:00 p.m., Friday, August 8, 2003.

Areas 7 and 7A:
Open to reefnets from 5:00 a.m. to 9:00 p.m., Saturday, August 2, 2003 and from 5:00 a.m. to 9:00 p.m., Sunday, August 3, 2003.

August 4 United States:
Treaty Indian Fishery
Areas 4B, 5, and 6C:
Extended for drift gillnets from 12:00 p.m. (noon) Wednesday, August 6, 2003 to 12:00 p.m. (noon) Saturday, August 9, 2003.

August 5 United States:
All-Citizen Fishery
Areas 7 and 7A:
Open to reefnets from 5:00 a.m. to 9:00 p.m., Thursday, August 7, 2003.

August 8 Canada:
Area 20:
Open to Area B purse seine Assessment Fishery fishing under the authority of a Scientific License from 7:00 a.m. to 7:00 p.m., Monday, August 11, 2003.

United States:
Treaty Indian Fishery
Areas 4B, 5, and 6C:
Extended for drift gillnets from 12:00 p.m. (noon) Saturday, August 9, 2003 to 12:00 p.m. (noon) Wednesday, August 13, 2003.

Areas 6, 7, and 7A:
Open to net fishing from 5:00 a.m., Saturday, August 9, 2003 to 7:30 a.m., Wednesday, August 13, 2003.

All-Citizen Fishery
Areas 7 and 7A:
Open to reefnets from 5:00 a.m. to 9:00 p.m., Tuesday, August 12, 2003.

August 11 Canada:
Area 29-1 to 7 and 9 to 17:
Open to Area E gillnets, from 8:00 a.m., Wednesday, August 13, 2003 to 8:00 a.m., Thursday, August 14, 2003.

August 12 Canada:

Area 18-1,4 and 11; and Area 29-1 to 6:

Open to Area H troll Individual Quota Project Fishery until 11:59 p.m., Wednesday, August 13, 2003.

Area 18-1,4 and 11; and Area 29-1 to 6:

Open to Area H troll Full Fleet Fishery until 11:59 p.m., Wednesday, August 13, 2003.

United States:

Treaty Indian Fishery

Areas 4B, 5, and 6C:

Extended for drift gillnets from 12:00 p.m. (noon) Wednesday, August 13, 2003 to 12:00 p.m. (noon) Saturday, August 16, 2003.

Areas 6, 7, and 7A:

Extended for net fishing from 7:30 a.m., Wednesday, August 13, 2003 to 5:00 a.m., Thursday, August 14, 2003. Open to net fishing 5:00 a.m., Friday, August 15, 2003 to 5:00 a.m., Saturday, August 16, 2003.

All-Citizen Fishery

Areas 7 and 7A:

Open to gillnets from 8:00 a.m. to 11:59 p.m., Thursday, August 14, 2003.

Areas 7 and 7A:

Open to purse seines from 5:00 a.m. to 9:00 p.m., Thursday, August 14, 2003.

Areas 7 and 7A:

Open to reefnets from 5:00 a.m. to 9:00 p.m., Wednesday, August 13, 2003 and from 5:00 a.m. to 9:00 p.m., Thursday, August 14, 2003.

August 15 United States:

Treaty Indian Fishery

Areas 4B, 5, and 6C:

Extended for drift gillnets from 12:00 p.m. (noon) Saturday, August 16, 2003 to 12:00 p.m. (noon) Wednesday, August 20, 2003.

Areas 6, 7, and 7A:

Open to net fishing from 5:00 a.m., Sunday, August 17, 2003 to 7:30 a.m., Tuesday, August 19, 2003.

All-Citizen Fishery

Area 7:

Open to gillnets from 6:00 p.m. to 11:59 p.m., Saturday, August 16, 2003.

Area 7A:

Open to gillnets from 8:00 a.m. to 11:59 p.m., Saturday, August 16, 2003.

Area 7:

Open to purse seines from 10:00 a.m. to 6:00 p.m., Saturday, August 16, 2003.

Area 7A:

Open to purse seines from 5:00 a.m. to 9:00 p.m., Saturday, August 16, 2003.

Areas 7 and 7A:
Open to gillnets from 8:00 a.m. to 11:59 p.m., Tuesday, August 19, 2003.

Areas 7 and 7A:
Open to purse seines from 8:00 a.m. to 9:00 p.m., Tuesday, August 19, 2003.

Areas 7 and 7A:
Open to reefnets from 5:00 a.m. to 9:00 p.m., Tuesday, August 19, 2003.

August 22 United States:
All-Citizen Fishery
Areas 7, 7A:
Open to reefnets from 5:00 a.m. to 9:00 p.m. daily, Saturday, August 23, 2003, Sunday, August 24, 2003, Monday, August 25, 2003, Tuesday, August 26, 2003, and Wednesday, August 27, 2003. Pink salmon may be retained; non-retention of sockeye salmon.

August 26 United States:
All-Citizen Fishery
Areas 7, 7A:
Extended for reefnets 5:00 a.m. to 9:00 p.m. daily, from Thursday, August 28, 2003 to Saturday, August 30, 2003. Pink salmon may be retained; non-retention of sockeye salmon.

August 29 United States:
Treaty Indian Fishery
Areas 4B, 5, and 6C:
Open to drift gillnets from 12:00 p.m. (noon) Tuesday, September 2, 2003 to 12:00 p.m. (noon) Friday, September 5, 2003.

Areas 6, 7, and 7A:
Open to net fishing from 5:00 a.m., Thursday, September 4, 2003 to 9:00 p.m., Friday, September 5, 2003, southerly and easterly of a straight line drawn from the low water range marker in Boundary Bay on the International Boundary through the east tip of Point Roberts in the State of Washington to the East Point Light on Saturna Island in the Province of British Columbia. Purse seines may retain pink salmon; non-retention of sockeye salmon.

All-Citizen Fishery
Areas 7 and 7A:
Open to purse seines from 5:00 a.m. to 9:00 p.m., Tuesday, September 2, 2003 and Wednesday, September 3, 2003, southerly and easterly of a straight line drawn from the low water range marker in Boundary Bay on the International Boundary through the east tip of Point Roberts in the State of Washington to the East Point Light on Saturna Island in the Province of British Columbia. Pink salmon may be retained; non-retention of sockeye salmon.

Areas 7, 7A:
Extended for reefnets, 5:00 a.m. to 9:00 p.m. daily, Sunday, August 31, 2003, Monday, September 1, 2003, Tuesday, September 2, 2003, Wednesday, September 3, 2003, Thursday, September 4, 2003, Friday, September 5, 2003 and Saturday, September 6, 2003, southerly and easterly of a straight line drawn from the low water range marker in Boundary Bay on the International Boundary through the east tip of Point Roberts in the State of Washington to

the East Point Light on Saturna Island in the Province of British Columbia. Pink salmon may be retained; non-retention of sockeye salmon.

September 5 Canada:

Area 20:

Relinquish regulatory control effective 12:01 a.m., Saturday, September 6, 2003.

Area 18-4:

Open to Area H troll from 12:01 a.m., Sunday, September 7, 2003 to 11:59 p.m., Tuesday, September 9, 2003. Pink salmon may be retained; non-retention of sockeye.

United States:

Treaty Indian and All-Citizen Fishery

Areas 4B, 5, and 6C:

Relinquish regulatory control effective 12:01 a.m., Saturday, September 6, 2003.

Treaty Indian Fishery

Areas 6, 7, and 7A:

Open to net fishing from 5:00 a.m., Tuesday, September 9, 2003 to 9:00 p.m., Wednesday, September 10, 2003, southerly and easterly of a straight line drawn from the low water range marker in Boundary Bay on the International Boundary through the east tip of Point Roberts in the State of Washington to the East Point Light on Saturna Island in the Province of British Columbia. Purse seines may retain pink salmon; non-retention of sockeye salmon.

All-Citizen Fishery

Areas 7 and 7A:

Open to purse seines from 5:00 a.m. to 9:00 p.m., Sunday, September 7, 2003, from 5:00 a.m. to 9:00 p.m. Monday, September 8, 2003, and from 5:00 a.m. to 9:00 p.m. Thursday, September 11, 2003, southerly and easterly of a straight line drawn from the low water range marker in Boundary Bay on the International Boundary through the east tip of Point Roberts in the State of Washington to the East Point Light on Saturna Island in the Province of British Columbia. Pink salmon may be retained; non-retention of sockeye salmon.

Areas 7, 7A:

Extended for reefnets, 5:00 a.m. to 9:00 p.m. daily, Sunday, September 7, 2003, Monday, September 8, 2003, Tuesday, September 9, 2003, Wednesday, September 10, 2003, Thursday, September 11, 2003, Friday, September 12, 2003, and Saturday, September 13, 2003. Pink salmon may be retained; non-retention of sockeye salmon.

September 9 Canada:

Area 18-4:

Extended for Area H troll from 12:01 a.m., Wednesday, September 10, 2003 to 11:59 p.m., Friday, September 12, 2003. Pink salmon may be retained; non-retention of sockeye salmon.

United States:

Treaty Indian Fishery

Areas 6, 7, and 7A:

Open to net fishing from 5:00 a.m. Friday, September 12, 2003 to 9:00 p.m. Saturday, September 13, 2003, southerly and easterly of a straight line drawn from the low water range marker in Boundary Bay on the International Boundary through the east tip of Point Roberts in the State of Washington to the East Point Light on Saturna Island in the Province of British Columbia. Purse seines may retain pink salmon; non-retention of sockeye.

September 12 United States:

Treaty Indian Fishery

Areas 6, 7, and 7A:

Open to net fishing from 5:00 a.m. to 11:59 p.m., Friday, September 12, 2003, southerly and easterly of a straight line drawn from the low water range marker in Boundary Bay on the International Boundary through the east tip of Point Roberts in the State of Washington to the East Point Light on Saturna Island in the Province of British Columbia. Purse seines may retain pink salmon; non-retention of sockeye salmon.

Areas 6, 7, and 7A:

Open to net fishing from 12:01 a.m., Saturday, September 13, 2003 to 8:00 p.m. Friday, September 19, 2003, southerly and easterly of a straight line drawn from the Iwersen's Dock on Point Roberts in the State of Washington to the Georgina Point Light at the entrance to Active Pass in the Province of British Columbia. Purse seines may retain pink salmon; non-retention of sockeye salmon.

All-Citizen Fishery

Areas 7 and 7A:

Open to purse seines from 6:00 a.m. to 8:00 p.m. daily Sunday, September 14, 2003, Monday, September 15, 2003, Tuesday, September 16, 2003, Wednesday, September 17, 2003, Thursday, September 18, 2003, and Friday, September 19, 2003, southerly and easterly of a straight line drawn from the Iwersen's Dock on Point Roberts in the State of Washington to the Georgina Point Light at the entrance to Active Pass in the Province of British Columbia. Pink salmon may be retained; non-retention of sockeye salmon.

Areas 7 and 7A:

Open to reefnets from 5:00 a.m. to 9:00 p.m. Friday, September 12, 2003, southerly and easterly of a straight line drawn from the low water range marker in Boundary Bay on the International Boundary through the east tip of Point Roberts in the State of Washington to the East Point Light on Saturna Island in the Province of British Columbia. Pink salmon may be retained; non-retention of sockeye salmon.

Areas 7 and 7A:

Open to reefnets from 5:00 a.m. to 9:00 p.m. Saturday, September 13, 2003, and from 6:00 a.m. to 8:00 p.m. daily Sunday, September 14, 2003, Monday, September 15, 2003, Tuesday, September 16, 2003, Wednesday, September 17, 2003, Thursday, September 18, 2003 and Friday, September 19, 2003, southerly and easterly of a straight line drawn from the Iwersen's Dock on Point Roberts in the State of Washington to the Georgina Point Light at the entrance

to Active Pass in the Province of British Columbia. Pink salmon may be retained; non-retention of sockeye salmon.

September 19 United States:

Treaty Indian and All-Citizen Fishery

Areas 6, 6A, 7:

Relinquish regulatory control effective 12:01 a.m., Saturday, September 20, 2003.

Area 7A:

Relinquish regulatory control of those waters southerly and easterly of a straight line drawn from the Iwersen's Dock on Point Roberts in the State of Washington to the Georgina Point Light at the entrance to Active Pass in the Province of British Columbia effective 12:01 a.m., Saturday, September 20, 2003.

Table 1. Commercial net catches of Fraser River sockeye salmon in Canadian Area 20 (Juan de Fuca Strait) by week for cycle years 1991-2003.

Date [1]	1991	1995	1999	2003 [2]
Jun. 29-Jul. 5	0	0	0	0
Jul. 6-Jul. 12	0	0	0	0
Jul. 13-Jul. 19	0	0	0	0
Jul. 20-Jul. 26	0	0	0	0
Jul. 27-Aug. 2	0	0	0	0
Aug. 3-Aug. 9	52,000	0	0	0
Aug. 10-Aug. 16	134,000	0	0	6,000
Aug. 17-Aug. 23	0	0	0	2,000
Aug. 24-Aug. 30	801,000	15,000	0	0
Aug. 31-Sep. 6	285,000	43,000	0	0
Sep. 7-Sep. 13	6,000	3,000	0	0
Sep. 14-Sep. 20	0	0	0	0
Sep. 21-Sep. 27	0	0	0	0
Sep. 28-Oct. 4	0	0	0	0
Oct. 5-Oct. 11	0	0	0	0
Total	1,278,000	61,000	0	8,000

1 Dates for the current year. For other years, data from the nearest week were used.

2 Includes selective fishery catches.

Table 2. Commercial net and troll catches of Fraser River sockeye salmon in Canadian Areas 17, 18, and 29 (Strait of Georgia and lower Fraser River) by week for cycle years 1991-2003.

Date [1]	1991	1995	1999	2003 [2]
Jun. 29-Jul. 5	0	0	0	0
Jul. 6-Jul. 12	125,000	0	0	0
Jul. 13-Jul. 19	0	0	0	0
Jul. 20-Jul. 26	0	0	0	0
Jul. 27-Aug. 2	118,000	0	0	2,000
Aug. 3-Aug. 9	242,000	0	1,000	116,000
Aug. 10-Aug. 16	156,000	0	0	140,000
Aug. 17-Aug. 23	17,000	54,000	0	0
Aug. 24-Aug. 30	152,000	88,000	0	0
Aug. 31-Sep. 6	19,000	45,000	0	0
Sep. 7-Sep. 13	63,000	0	0	0
Sep. 14-Sep. 20	33,000	0	0	0
Sep. 21-Sep. 27	1,000	0	0	0
Sep. 28-Oct. 4	8,000	0	0	0
Oct. 5-Oct. 11	1,000	0	0	0
Total	935,000	187,000	1,000	258,000

1 Dates for the current year. For other years, data from the nearest week were used.

2 Includes selective fishery catches.

Table 3. Commercial troll landings of Fraser River sockeye salmon in Canadian Areas 121 to 127 (west coast of Vancouver Island) by week for cycle years 1991-2003.

Date[1]	1991	1995	1999	2003
Jun. 29-Jul. 5	0	0	0	0
Jul. 6-Jul. 12	0	0	0	0
Jul. 13-Jul. 19	0	0	0	0
Jul. 20-Jul. 26	0	0	0	0
Jul. 27-Aug. 2	1,000	0	0	0
Aug. 3-Aug. 9	29,000	8,000	1,000	0
Aug. 10-Aug. 16	77,000	12,000	0	0
Aug. 17-Aug. 23	334,000	0	0	0
Aug. 24-Aug. 30	929,000	11,000	0	0
Aug. 31-Sep. 6	20,000	2,000	0	0
Sep. 7-Sep. 13	0	0	0	0
Sep. 14-Sep. 20	0	0	0	0
Sep. 21-Sep. 27	2,000	0	0	0
Sep. 28-Oct. 4	0	0	0	0
Oct. 5-Oct. 11	0	0	0	0
Total	1,392,000	33,000	1,000	0

1 Dates for the current year. For other years, data from the nearest week were used.

Table 4. Commercial net and troll catches of Fraser River sockeye salmon in Canadian Areas 11 to 16 (Johnstone Strait and northern Strait of Georgia) by week for cycle years 1991-2003.

Date[1]	1991	1995	1999	2003[2]
Jun. 29-Jul. 5	0	0	0	0
Jul. 6-Jul. 12	0	0	0	0
Jul. 13-Jul. 19	0	0	0	0
Jul. 20-Jul. 26	0	0	0	0
Jul. 27-Aug. 2	4,000	0	23,000	166,000
Aug. 3-Aug. 9	85,000	0	20,000	549,000
Aug. 10-Aug. 16	455,000	300,000	4,000	55,000
Aug. 17-Aug. 23	876,000	0	0	0
Aug. 24-Aug. 30	689,000	53,000	0	0
Aug. 31-Sep. 6	231,000	97,000	0	0
Sep. 7-Sep. 13	15,000	24,000	0	0
Sep. 14-Sep. 20	62,000	6,000	0	0
Sep. 21-Sep. 27	1,000	0	0	0
Sep. 28-Oct. 4	2,000	0	0	0
Oct. 5-Oct. 11	0	0	0	0
Total	2,420,000	480,000	47,000	770,000

1 Dates for the current year. For other years, data from the nearest week were used.

2 Includes selective fishery catches.

Table 5. Catches of Fraser River sockeye salmon in First Nations fisheries by area (Fraser River mainstream or tributary areas), for cycle years 1991-2003.*

Fishing Area		1991	1995		1999	2003
Fraser River Mainstem						
Below Port Mann	*1*	70,100	131,700		26,200	114,900
Port Mann to Mission	*1*	15,500	119,600		14,700	88,800
Mission to Hope		142,900	111,900		26,600	66,600
Hope to Sawmill Cr.	*2*	190,400	213,800		69,800	153,600
Sawmill Cr. to Kelly Cr.	*2*	95,000	267,500	*5*	72,800	114,100
Kelly Creek to Naver Cr.	*3*	31,200	6,900		5,800	2,900
Above Naver Cr.	*3*	5,000	2,100		3,200	4,400
Total		550,100	853,500		219,100	545,300
Tributaries						
Harrison/Lillooet System		1,800	n/a	*4*	n/a	*4* n/a *4*
Thompson System		300	8,200	*5*	2,600	8,700
Chilcotin System		34,600	19,200		19,800	29,600
Nechako System		11,600	3,900		6,200	n/a *4*
Stuart System		7,600	7,400		3,800	3,400
Total		55,900	38,700		32,400	41,700
Total Fraser Catch		606,000	892,200		251,500	587,000
Marine Areas		91,000	32,000		95,000	218,000

* Data supplied by DFO.

1 Prior to 1995, the divisions were Steveston, and Deas to Mission.

2 Prior to 1993, the divisions were Hope to North Bend, and North Bend to Churn Creek.

3 Prior to 1994, the divisions were Churn Creek to Hixon, and above Hixon.

4 No estimate available because fisheries were not monitored.

5 Schwartz, C.J. 1996. Analysis of the 1995 Upper Fraser River Catch Monitoring Program of First Nations Fisheries. Prepared for DFO [Vancouver, B.C.].

Table 6. Commercial net catches of Fraser River sockeye salmon in United States Areas 4B, 5, 6, 6C, 7, and 7A (Juan de Fuca Strait and northern Puget Sound) by week for cycle years 1991-2003.

Date[1]	1991	1995	1999	2003
Jun. 29-Jul. 5	0	0	0	0
Jul. 6-Jul. 12	0	0	0	0
Jul. 13-Jul. 19	43,000	2,000	0	0
Jul. 20-Jul. 26	0	0	0	2,000
Jul. 27-Aug. 2	0	8,000	7,000	43,000
Aug. 3-Aug. 9	17,000	142,000	13,000	76,000
Aug. 10-Aug. 16	126,000	12,000	0	103,000
Aug. 17-Aug. 23	659,000	74,000	0	19,000
Aug. 24-Aug. 30	564,000	134,000	0	0
Aug. 31-Sep. 6	139,000	14,000	0	0
Sep. 7-Sep. 13	163,000	23,000	0	0
Sep. 14-Sep. 20	78,000	0	0	0
Sep. 21-Sep. 27	27,000	0	0	0
Sep. 28-Oct. 4	1,000	0	0	0
Oct. 5-Oct. 11	0	0	0	0
Total	1,817,000	409,000	20,000	243,000

1 Dates for the current year. For other years, data from the nearest week were used.

Table 7. Commercial net catches of Fraser River pink salmon in Canadian Area 20 (Juan de Fuca Strait) by week for cycle years 1997-2003.

Date[1]	1997	1999	2001	2003
Jun. 29-Jul. 5	0	0	0	0
Jul. 6-Jul. 12	0	0	0	0
Jul. 13-Jul. 19	0	0	0	0
Jul. 20-Jul. 26	0	0	0	0
Jul. 27-Aug. 2	0	0	0	0
Aug. 3-Aug. 9	0	0	8,000	0
Aug. 10-Aug. 16	17,000	0	0	4,000
Aug. 17-Aug. 23	107,000	0	0	0
Aug. 24-Aug. 30	177,000	0	0	0
Aug. 31-Sep. 6	0	0	0	0
Sep. 7-Sep. 13	0	0	0	0
Sep. 14-Sep. 20	0	0	0	0
Sep. 21-Sep. 27	0	0	0	0
Sep. 28-Oct. 4	0	0	0	0
Oct. 5-Oct. 11	0	0	0	0
Total	301,000	0	8,000	4,000

1 Dates for the current year. For other years, data from the nearest week were used.

Table 8. Commercial net and troll catches of Fraser River pink salmon in Canadian Areas 17, 18, and 29 (Strait of Georgia and lower Fraser River) by week for cycle years 1997-2003.

Date[1]	1997	1999	2001	2003
Jun. 29-Jul. 5	0	0	0	0
Jul. 6-Jul. 12	0	0	0	0
Jul. 13-Jul. 19	0	0	0	0
Jul. 20-Jul. 26	0	0	0	0
Jul. 27-Aug. 2	0	0	0	0
Aug. 3-Aug. 9	1,000	0	0	3,000
Aug. 10-Aug. 16	0	0	0	15,000
Aug. 17-Aug. 23	6,000	0	0	0
Aug. 24-Aug. 30	48,000	0	0	0
Aug. 31-Sep. 6	109,000	0	0	0
Sep. 7-Sep. 13	3,000	0	0	1,000
Sep. 14-Sep. 20	2,000	0	0	0
Sep. 21-Sep. 27	0	0	0	0
Sep. 28-Oct. 4	0	0	0	0
Oct. 5-Oct. 11	0	0	0	0
Total	169,000	0	0	19,000

1 Dates for the current year. For other years, data from the nearest week were used.

Table 9. Commercial troll landings of Fraser River pink salmon in Canadian Areas 121 to 127 (west coast of Vancouver Island) by week for cycle years 1997-2003.

Date [1]	1997	1999	2001	2003
Jun. 29-Jul. 5	0	0	0	0
Jul. 6-Jul. 12	0	0	0	0
Jul. 13-Jul. 19	0	0	1,000	0
Jul. 20-Jul. 26	0	0	0	0
Jul. 27-Aug. 2	0	0	5,000	0
Aug. 3-Aug. 9	1,000	1,000	2,000	0
Aug. 10-Aug. 16	1,000	0	0	0
Aug. 17-Aug. 23	5,000	0	0	0
Aug. 24-Aug. 30	2,000	0	0	0
Aug. 31-Sep. 6	2,000	0	0	1,000
Sep. 7-Sep. 13	0	0	0	0
Sep. 14-Sep. 20	0	0	0	0
Sep. 21-Sep. 27	0	0	0	0
Sep. 28-Oct. 4	0	0	0	0
Oct. 5-Oct. 11	0	0	0	0
Total	11,000	1,000	8,000	1,000

1 Dates for the current year. For other years, data from the nearest week were used.

Table 10. Commercial net and troll catches of Fraser River pink salmon in Canadian Areas 11 to 16 (Johnstone Strait and northern Strait of Georgia) by week for cycle years 1997-2003.

Date [1]	1997	1999	2001	2003
Jun. 29-Jul. 5	0	0	0	0
Jul. 6-Jul. 12	0	0	0	0
Jul. 13-Jul. 19	0	0	0	0
Jul. 20-Jul. 26	0	0	7,000	0
Jul. 27-Aug. 2	37,000	0	10,000	20,000
Aug. 3-Aug. 9	152,000	2,000	31,000	311,000
Aug. 10-Aug. 16	319,000	0	0	28,000
Aug. 17-Aug. 23	297,000	0	0	0
Aug. 24-Aug. 30	533,000	0	150,000	0
Aug. 31-Sep. 6	682,000	4,000	530,000	2,000
Sep. 7-Sep. 13	572,000	0	0	436,000
Sep. 14-Sep. 20	342,000	0	0	0
Sep. 21-Sep. 27	60,000	0	0	0
Sep. 28-Oct. 4	13,000	0	0	0
Oct. 5-Oct. 11	0	0	3,000	3,000
Total	3,007,000	6,000	731,000	800,000

1 Dates for the current year. For other years, data from the nearest week were used.

Table 11. Catches of Fraser River pink salmon in Canadian First Nations fisheries by area (Fraser River mainstream or tributary areas), for cycle years 1997-2003.*

Fishing Area	1997	1999	2001	2003
Fraser River Mainstem				
Below Port Mann	2,200	5,500	500	3,200
Port Mann to Mission	4,200	200	800	5,500
Mission to Hope	14,700	2,700	115,400	284,300
Hope to Sawmill Cr.	6,600	300	400	900
Sawmill Cr. to Kelly Cr.	900	0	0	1,600
Kelly Creek to Naver Cr.	0	0	0	100
Above Naver Cr.	0	0	0	0
Total	28,600	8,700	117,100	295,600
Tributaries				
Harrison/Lillooet System	0	0	0	0
Thompson System	0	0	0	500
Chilcotin System	0	0	0	0
Nechako System	0	0	0	0
Stuart System	0	0	0	0
Total	0	0	0	500
Total Fraser Catch	28,600	8,700	117,100	296,100
Marine Areas	11,000	56,700	16,000	0

* Data supplied by DFO.

Table 12. Commercial net catches of Fraser River pink salmon in United States Areas 4B, 5, 6, 6C, 7, and 7A (Juan de Fuca Strait and northern Puget Sound) by week for cycle years 1997-2003.

Date [1]	1997	1999	2001	2003
Jun. 29-Jul. 5	0	0	0	0
Jul. 6-Jul. 12	0	0	0	0
Jul. 13-Jul. 19	0	0	0	0
Jul. 20-Jul. 26	1,000	0	1,000	1,000
Jul. 27-Aug. 2	2,000	1,000	5,000	14,000
Aug. 3-Aug. 9	4,000	2,000	1,000	18,000
Aug. 10-Aug. 16	20,000	0	0	74,000
Aug. 17-Aug. 23	68,000	0	1,000	90,000
Aug. 24-Aug. 30	260,000	0	1,000	29,000
Aug. 31-Sep. 6	596,000	0	139,000	132,000
Sep. 7-Sep. 13	536,000	0	264,000	380,000
Sep. 14-Sep. 20	55,000	0	13,000	34,000
Sep. 21-Sep. 27	4,000	0	0	0
Sep. 28-Oct. 4	0	0	0	0
Oct. 5-Oct. 11	0	0	0	0
Total	1,546,000	3,000	425,000	772,000

1 Dates for the current year. For other years, data from the nearest week were used.

Table 13. Escapements of sockeye salmon to Fraser River spawning areas for cycle years 1987-2003.

DISTRICT	Estimated Number of Adult Sockeye *					Jacks
Stream/Lake	1987	1991	1995	1999	2003	2003
NORTHEAST						
Upper Bowron R.	11,071	4,919	34,417	8,238	6,752	0
STUART						
Early Runs						
Driftwood R.	Present	2,746	4,046	183	425	0
Takla L. Streams	27,614	25,857	15,134	2,173	3,080	0
Middle R. Streams	100,706	81,071	76,619	17,834	7,553	0
Trembleur L. Streams	19,874	31,445	26,911	4,342	2,100	0
Early Stuart Total	148,194	141,119	122,710	24,532	13,158	0
Late Runs						
Middle R.	2,441	16,331	7,462	8,559	3,966	217
Tachie R.	2,398	50,841	22,368	44,273	28,477	1,499
Miscellaneous	1,633	9,688	4,532	8,742	4,204	111
Late Stuart Total	6,472	76,860	34,362	61,574	36,647	1,827
NECHAKO						
Nadina R. (Late)	7,890	5,000	2,499	3,239	1,557	0
Nadina Channel	29,734	56,074	21,499	7,099	1,606	0
Stellako R.	211,085	94,884	141,813	138,137	78,093	0
QUESNEL						
Upper Horsefly R.	14,531	14,000	178,533	133,417	154,914	0
Lower Horsefly R.	2,201	5,754	- 1	- 1	- 1	0
Horsefly Channel	-	18,815	- 1	5,974	22,965	0
McKinley Cr.	63	0	380	943	3,748	0
Mitchell R.	3,751	7,690	35,190	46,451	88,887	0
Miscellaneous	-	-	-	2,575	8,656	0
Quesnel Total	20,546	46,259	214,103	189,360	279,170	0
CHILCOTIN						
Chilko R.	239,601	1,017,242	526,243	891,567	608,321	3,918
Chilko Channel	-	20,495	8,318	- 2	- 2	0
Chilko L.-South End	181,414	- 2	- 2	- 2	- 2	0
SETON-ANDERSON						
Gates Cr.	1,725	952	7,181	88	880	56
Gates Channel	7,692	8,088	- 3	4,047	8,931	568
Portage Cr.	6,820	12,053	7,875	6,264	4,940	86
NORTH THOMPSON						
Raft R.	1,436	464	1,040	6,979	10,040	53
Fennell Cr.	16,633	20,466	11,235	5,697	9,087	239
SOUTH THOMPSON						
Early Runs						
Seymour R.	84,315	128,253	51,723	18,895	31,345	0
Scotch Cr.	2,089	9,954	14,815	4,093	5,089	2
Anstey R.	2,257	5,011	3,562	2,245	1,850	0
Eagle R.	879	3,677	3,679	3,818	2,012	0
Late Runs						
Adams R.	567,989	1,204,153	378,903	279,424	355,866	0
Little R.	17,998 4	13,500	9,125	19,345	15,647	0
Lower Shuswap R.	10,343	15,678	12,330	7,081	5,767	0
Miscellaneous	20,995	22,460	11,473	2,698	3,998	0
HARRISON-LILLOOET						
Birkenhead R.	164,849	293,626	38,588	48,916	309,878	652
Harrison R.	5,228	15,000	16,618	8,577	8,259	350
Weaver Cr.	26,272	10,179	12,832	13,520	14,452	177
Weaver Channel	33,696	27,942	21,199	21,114	35,036	212
LOWER FRASER						
Nahatlatch R. & L.	13,501	2,755	2,297	2,613	3,070	0
Cultus L.	32,184	20,157	10,316	12,392	1,939	1
Upper Pitt R.	13,637	22,500	5,500	35,961	78,229	15
MISCELLANEOUS	9,402	6,552	4,838	2,767	47,521 4	419
ADULTS	1,895,947	3,306,272	1,731,093	1,830,280	1,979,140	8,575
JACKS	18,796	35,191	20,237	2,479	8,575	
TOTAL NET ESCAPEMENT	1,914,743	3,341,463	1,751,330	1,832,759	1,987,715	

* Estimates are from DFO.

1 Included in Upper Horsefly River estimate.

2 Included in Chilko River estimate.

3 Gates Creek Channel not operated in 1995.

4 Includes North Thompson River escapement of 23,877 adults

Table 14. Fraser River pink salmon production for odd brood years from 1961-2001.

Brood Year	Spawners		Potential Egg Deposition	Fry Production	Adult Returns (Catch + Escapement)	% Survival		Average To Date
	Total (millions)	Female (millions)	(millions)	(millions)	(millions)	Freshwater	Marine	
1961	1.094	0.654	1,569	143.6	5.482	9.2%	3.8%	3.8%
1963	1.953	1.216	2,435	284.2	2.320	11.7%	0.8%	2.3%
1965	1.191	0.692	1,488	274.0	12.963	18.4%	4.7%	3.1%
1967	1.831	0.973	2,132	237.6	3.931	11.1%	1.7%	2.8%
1969	1.529	0.957	2,018	195.6	9.763	9.7%	5.0%	3.2%
1971	1.804	1.096	1,923	245.4	6.801	12.8%	2.8%	3.1%
1973	1.754	1.009	1,865	292.4	4.894	15.7%	1.7%	2.9%
1975	1.367	0.781	1,493	279.2	8.209	18.7%	2.9%	2.9%
1977	2.388	1.362	2,960	473.3	14.404	16.0%	3.0%	2.9%
1979	3.561	2.076	3,787	341.5	18.685	9.0%	5.5%	3.2%
1981	4.488	2.560	4,814	590.2	15.346	12.3%	2.6%	3.1%
1983	4.632	2.931	4,702	554.8	19.104	11.8%	3.4%	3.2%
1985	6.461	3.561	5,900	256.1	7.172	4.3%	2.8%	3.1%
1987	3.224	1.856	3,471	406.9	16.484	11.7%	4.1%	3.2%
1989	7.189	4.383	7,198	360.0	22.180	5.0%	6.2%	3.4%
1991	12.949	8.002	12,330	697.0	16.983	5.7%	2.4%	3.3%
1993	10.768	6.454	9,192	439.0	12.904	4.8%	2.9%	3.3%
1995	7.175	4.248	10,233	272.3	8.176	2.7%	3.0%	3.3%
1997	2.842	1.740	2,863	252.9	3.586	8.8%	1.4%	3.2%
1999	3.422	1.885	2,702	222.8	21.174	8.2%	9.5%	3.5%
2001 *	19.725	9.543	16,274	680.9	26.000	4.2%	3.8%	3.5%
Average	4.826	2.761	4,826	357.1	12.217	10.1%	3.5%	

* The estimated adult return from the 2001 brood has high uncertainty because DFO did not conduct an escapement enumeration program in 2003. The estimate of adult return from the 2001 brood year is based on the final in-season run size estimate by the PSC.

APPENDIX I: STAFF OF THE PACIFIC SALMON COMMISSION IN 2003

EXECUTIVE OFFICE

Mr. D. Kowal, Executive Secretary
Ms. M. Cote, Secretary (Term)
Mrs. V. Ryall, Meeting Planner
Ms. T. Tarita, Librarian/Records Administrator

FINANCE AND ADMINISTRATION

Mr. K. Medlock, Controller
Ms. B. Dalziel, Accountant

FISHERIES MANAGEMENT DIVISION STAFF

Mr. J. Gable, Chief (Acting)
Mr. M. Lapointe, Chief

BIOMETRICS / CATCH STATISTICS GROUP

Mr. I. Guthrie, Head

COMPUTER SERVICES GROUP

Ms. K. Mulholland, Computer System Manager
Ms. S. Wadley, Information Technology Support Specialist

RACIAL IDENTIFICATION GROUP

Mr. J. Gable, Head
Ms. J. Boffey, Scale Lab Assistant (Term)
Mr. V. Keong, Resource Management Technician (Term)
Mr. S. Latham, Sockeye Racial Analysis Biologist
Ms. M. Reichardt, Senior Scale Analyst
Ms. J. Sellars, Scale Analyst
Mr. B. White, Pink Racial Analysis Biologist

STOCK MONITORING GROUP

Mr. J. Cave, Head
Mr. P. Cheng, Hydroacoustics Biologist
Mr. K. Forrest, Test Fishing Biologist (Acting)
Mr. A. Gray, Hydroacoustics Biologist
Ms. F. Martens, Hydroacoustics Technician (Term)
Dr. Y. Xie, Hydroacoustic Scientist